Prenatal Maternal Depression Symptoms and Dietary Intake – A Population Based Study in Rural Pakistan

Thesis submitted in accordance with the requirements of the University of Liverpool for the of Doctor of Philosophy by

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ABSTRACT

Background: High prevalence of depression among pregnant women has been observed in low and middle-income countries including Pakistan.Pregnancy is an important stressor for depression and depressed women tend to have poor dietary intake.The present study aimed to determine the prevalence of prenatal depression and its risk factors, and explored the relationship of prenatal depression with dietary intake in a representative sample of women living in a rural setting of Pakistan.

Methods: This study was conducted at the baseline of a large cluster randomised controlled trial. Five hundred pregnant women in the second and third trimester of pregnancy, living a in a rural area of district Rawalpindi Pakistan, were recruited for the baseline of the trial. Depression was assessed using "Patient Health Questionnaire" (PHQ9), with a cut-off score of 10, and the dietary intake assessment was carried out by"Food Frequency Questionnaire" and "24 Hour Dietary Recall".Data on stressful life-events and perceived social support were captured through "Life Events Checklist" and "Multidimensional Scale of Perceived Social Support".All pregnant women who had PHQ-9 scores of 10 or more were invited to participate. Those women whose PHQ 9 was less than 10 were selected through simple random sampling and invited for baseline measurements after obtaining informed consent. Response rate was around 98%.Appropriate tests of significance were used for bivariate analysis. Final Generalized Linear Model with logit link function was obtained.

Results: The prevalence of prenatal depression was found to be 27%.Depressed pregnant women belonged to 23-30 years age group, were less educated had,lived in joint family and had less perceived support from family and friends.Depressed women suffered from at least 3-4 stressful life events .Food variety scores were generated and dichotomized at median for dietary inadequacy. Mean intake of all the energy, macronutrients and micronutrients was significantly less among depressed ($p<0.001$).Prenatal depression was significantly associated with dietary inadequacy ($P<0.05$). In addition factors like life satisfaction, husband away from home in last six months ($P<0.05$), physical IPV ($P<0.05$) and stressful life events ($P<0.01$) were also independently associated with dietary inadequacy.

Conclusion: The current study to the best of my knowledge is the first study to investigate in a large rural community based sample of women the link between

prenatal depression and dietary intake. Most of the depressed women did not eat sufficient items from various food groups to meet the recommended dietary allowance. Prenatal depression was independently associated with inadequate dietary intake. Risk factors for prenatal depression as well as dietary inadequacy were psychosocial in nature. There is a need to screen women at antenatal visit and provide nutritional counselling to improve dietary behaviors for better pregnancy outcomes.

DECLARATION

I certify that I have read and understood the rules and regulations of University of Liverpool regarding assessment procedures and offences. I confirm that the work presented in this thesis is my own apart from properly referenced quotations. Where information has been derived from other sources, I confirm that this has been indicated in the thesis. Where my work is indebted to others, I have made acknowledgements.

I declare that the material contained in this thesis has not been accepted in substance wholly or partly for any other degree, nor is it currently being submitted in candidature for any other degree.

ACKNOWLEDGEMENT

I owe my gratitude to Almighty God in whom and through whom the all the work which went into this thesis was made possible. I want to acknowledge all those who in one way or another contributed in the completion of this thesis. Above all I am grateful to my supervisors, Dr Atif Rahman and Dr Mukesh Dherani, from whom I learnt a lot. Professor Atif"s wealth of experience in maternal mental health, global public health and health systems gave me an opportunity to broaden my vision. I am grateful for his generous and patient advice and guidance throughout my research and beyond. I would specially like to thank Dr Mukesh Dherani who co-supervised the work and provided his detailed feedback and advice especially in statistical analysis.

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Of course, none of this would have been possible without the field team. I am grateful to Human Development Research Foundation (HDRF) for operational assistance in completing the field work, activities. Importantly, I would like to thank my field team in Kallar Syedan - Mr Ikhlaq Ahmed project coordinator and,Miss Tayyaba Abbasi, Miss Amna Ijaz , Miss Quratul Ain, Nida Amin and Miss Rakhshanda who worked tirelessly.

I am grateful to the people behind the numbers - all those women and their families who were part of this study.

ABOUT THE AUTHOR

Born and brought up in large cities of Pakistan, I did MBBS from Allama Iqbal Medical College Lahore and pursued my carrier as general physician. After a decade I got opportunity to get a MPH degree from Health Services Academy (HSA) Islamabad. I joined LHWs program as training consultant for a short time when I shifted to South Africa because of my husband's appointment. I joined clinical epidemiology department as research officer voluntarily and also joined MSc clinical epidemiology degree program .I returned to Pakistan and joined Health Services Academy as Assistant Professor. Along with teaching epidemiology I got a chance to start an elective course in Public Health Nutrition which was my area of interest for Masters of Public Health students with a senior expert. Research sites of Human Development Research Foundation were used as field demonstration area for HSA students. As a coordinator I used to visit the sites with students and found the research in mental health interesting and wanted to take up a topic with focus on nutrition and mental health as a PhD thesis. While I was in the decision making process I came across a saying by the Founder of Pakistan Quaid- e -Azam Muhammad Ali Jinnah

"Think one hundred times before you take a decision

But once a decision is taken stand by it as a man"

This was my motivation. Although it was not easy to take a decision to take up PhD studies given the work, finance and family considerations yet I took a decision and stood by it.

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LIST OF ABBREVIATIONS

AKUADS	Aga Khan University anxiety and depression Scale
AMPM	Automated Multiple-Pass Method
AND	Antenatal depression
BDI	Beck's Depression Inventory
BHU	Basic Health unit
BMI	Body mass index
C-Section	Caesarean section
CCEI	Crown-Crisp Experiential Inventory
CDC	Center of disease control
CDSR	Cochrane database of Systematic Reviews
CES-D	Center of Epidemiologic Studies Depression Scale
CI	Crowding Index
CMD	Common mental disorder
COBRA	Control of blood pressure and risk Attenuation
CVD	Cardiovascular disease
DHA	Docosahexaenoic Acid
DHQ	Diet History Questionnaire
DHS	Demographic Health Survey
DQI-P	Dietary Quality Index–Pregnancy
DQI-P	Diet quality Index for pregnancy
DSM-IV	Diagnostic and statistical Manual of mental Disorders Fourth Edition
ED	Eating Disorder
EPA	Eicosapentaenoic Acid
EPDS	Edinburg Postpartum Depression Scale

FFQ	Food frequency questionnaire
FRED	Food recording electronic device
GHQ	General Health Questionnaire
GLM	Generalized linear model
GT	Grand trunk
HADS	Hospital anxiety and Depression Scale
HCI	Household crowding index
HDRF	Human Development Research Foundation
HP	Health professionals
HSFFQ	Harvard Service FFQ
ID	Identification
IOM	Institute of Medicine
IPV	Intimate Partner violence
K10	Kessler psychological distress scales
KKH	KK Women's and Children's Hospital
LCPUFA	Long Chain Polyunsaturated Fatty acid
LEDS	Life events and difficulties Schedule
LHW	Lady Health workers
LMIC	Low middle income countries
MeSH	Medical Subject Headings
MIS	Mental illness Surveillance
MMN	Multiple micronutrients
MSPSS	Multidimensional Scale of perceived social support
MSSI	Maternal social Support Index
mWFFQ	Modified Willett food frequency questionnaire
NCI	National cancer Institute

NHANES	National Health and Nutrition Examination Survey
NIMH	U.S national Institute of mental health
NNS	National nutrition Survey
NUH	National University Hospital
OR	Odds ratio
PCA	Principal Component analysis
PHQ9	Patient health questionnaire
PI	Principle Investigator
PKR	Pakistani Rupee
PND	Postnatal depression
PPD	Postpartum depression
PPV	Positive predictive value
PURE	Prospective Urban Rural Epidemiological Study
RDA	Recommended Dietary Allowance
S.D	Standard Deviation
SCAN	Schedule for Clinical Assessment in Neuropsychiatry
SHARE	South Asian Hub for Advocacy, Research and Education for mental health
SRQ	Self -reporting questionnaire
STAI	Spielberger State-Trait Anxiety Inventory
TFA	Trans fatty acid
THP	Think healthy program
THPP	Thinking healthy program Peer Delivered
UC	Union Council
UNICEF	United Nations International Children's Emergency Fund

USA	United States of America
USDA	U.S. Department of Agriculture
USDA	United State Department of Agriculture
VIF	Variance Inflation Factor
WHO	World Health Organization

Section I (Chapter 1 – 6)

CHAPTER 1

INTRODUCTION TO THE PROBLEM AND STUDY

1.1 Introduction

This chapter sets out the context in which this research has been carried out. Pregnancy is the most important and crucial phase of reproductive health. Having a healthy pregnancy, both physically and mentally, is one of the best ways to promote a healthy birth. In health care system of Pakistan, the primary focus tends to be on physical well-being. Mental comfort, although essential, is a relatively neglected part of the reproductive health area. Many women experience mental discomfort in the pregnancy phase, with depression being one such symptom. Depression is a serious and pervasive mood disorder which causes feelings of sadness, hopelessness, helplessness and worthlessness (Ko et al., 2012).

1.2 Prenatal Depression

Delivering a baby and then nurturing it can be an exhilarating experience for a woman. However, new mothers, regularly confronted by the challenge of dealing with a disjunction between their own negative thoughts and society's admiration of parenthood, are often confused. Most mothers, who experience these emotional progressions, are capable of recovering rapidly. For some mothers, however, these feelings do not go away or get worse. These females may have a diagnosable type of maternal depression (Ko et al., 2012). The term is used to portray a spectrum of conditions, such as pre-birth depression, that is also known as prenatal depression or antenatal depression (Monk et al., 2013).

1.3 Risk Factors for Prenatal Depression

Literature has shown that a family history of depression, difficulties in relationships, stressful life events, a history of abuse, lack of social support and family violence, are risk factors for depression in pregnancy. Miscarriages, other problems with pregnancy, unplanned pregnancy, and the fear of labour have also been distinguished as dangerous factors for prenatal depression (Roomruangwong and Epperson, 2011a).

Studies from Pakistan (Rahman et al., 2003b, Irfan and Badar, 2003) have documented that the following are the risk factors for prenatal depression: the expecting mother being young, illiterate, a housewife, having a history of psychiatric disorders, living in remote areas, poverty, the husband being away for work, adverse life events before pregnancy, already having two or more daughters, and an illiterate and unemployed husband.

1.4 Depression as a Risk Factor for Dietary Practices

The pre- and post-natal periods are times when women become more vulnerable to mental disorders, such as depression and anxiety, which lead to behavioural disturbances, besides poor dietary habits, alcohol and tobacco intake, each of which have the potential to affect the well-being of both mother and infant (Verbeke and De Bourdeaudhuij, 2007). Although several studies have shown an association between depression and its effects on nutrient status in the general adult population(Sánchez-Villegas et al., 2009, Jacka et al., 2009), very few researchers have studied the association of maternal depression and dietary intake.

Rarely studies focus on nutrition and the mental health of pregnant women. Several studies about the psychological status of women in Pakistan have been conducted (Qadir et al., 2015, Khan et al., 2015, Kidwai, 2014, Niaz, 2004, Karmaliani et al., 2009) and a few studies have also been conducted on the prevalence and risk factors for depression among pregnant women (Rahman and Creed, 2007, Rahman et al., 2003b), but the link between maternal depression and its effect on their dietary intake remains unexplored at the population level in Pakistan .

1.5 Problem Statement

The problem statement for the present study is: “Examining the symptoms of prenatal depression and its association with dietary practices in Pakistan where both dietary inadequacy and prenatal depression are prevalent”.

1.6 Significance of the Study

A number of hereditary, social, cultural, environmental, economic and nutritional components are major risk factors for prenatal depression. One biological variable that has received increasing attention has been identified as ‘inadequate diet’.

Credible connections between food and mood have been identified with respect to folate, vitamin B12, calcium, iron, selenium, zinc and polyunsaturated unsaturated fats.

While there is sufficient research on prenatal depression, much less work has been conducted to identify how depression affects the food intake practices of pregnant women. It is known that both problems are treatable as well as modifiable, but the extent to which both are dependent upon each other and how they can be dealt, is hard to identify in published literature.

There is a need to unravel the relationship between diet and depression in pregnancy and their effect on the health of mother and infant to provide clear guidance on nutritional choices and to prevent depression during pregnancy.

The significance of this research, therefore, is to study the problems faced by depressed mothers with respect to dietary intake practices. The identification of such problems would play a significant role in the strategic development of interventions for many Pakistani mothers who are suffering from depression and inadequate dietary intake.

1.7 Structure of the Thesis

This PhD research was conducted in a representative sample of pregnant women in second and third trimester living in Kallar Syedan, a sub district of Rawalpindi Pakistan. Study data was collected at the same time but it is described in two sections which are reflected in the layout of the thesis. The first section is related to the prevalence and risk factors of Prenatal Depression, and is described in chapters 1 to 6. The second Section describes the dietary practices of pregnant women and explores the association between depression and dietary practices in chapters 7 to 12. Chapter 13 concludes the study. The instruments for both sections of the study were introduced to the participants at the same time.

The layout of the chapters is as follows:

- Chapter 1: Describes the background to the study and settings in which it was conducted.
- Chapter 2: Appraises the current literature on prevalence and risk factors for prenatal depression.

- Chapter 3: Gives the aim and objectives of first section of study related to prevalence and risk factors for prenatal depression. .
- Chapter 4: Describes the methodology for conducting section 1 of study.
- Chapter 5: Describes the findings from section 1of study.
- Chapter 6: Discusses the findings in relation to other literature in Pakistan and other regions of the world, and the implications of the findings for future research and policy.
- Chapter 7: Appraises the review of literature for "Dietary intake of pregnant women".
- Chapter 8: Provides a systematic review of literature related to association of prenatal depression with dietary intake".
- Chapter 9: Gives the aim and objectives of section 2 of study regarding prenatal depression and dietary intake.
- Chapter 10: Describes the Methodology of section 2 of study.
- Chapter 11: Describe the findings from section 2 of study.
- Chapter 12: Discusses the findings in relation to the findings of part one of the study and the association of prenatal depression with dietary practices, and the implications of the findings for future research and policy.
- Chapter 13: Concludes the study, presents recommendations and the need for future research and studies in the field.

Author's Contribution:

I was physically present during all the stages of the research, from planning to the execution of research. I was also fully involved in all field activities, teaching, training, and brain storming sessions with the research team. My supervisor and research coordinators from the Human Development Research Foundation continually guided me. I did all the co-ordinations, where required, with LHWs and the communities. I visited communities with the assistance of LHWs prior to the field work

to get to know the usual food items consumed in the area, and the utensils used in the community, to have a better judgment of portion sizes. I collected data with the teams and attended all the meetings and joined coordinators in monitoring and supervision activities. I entered all the data and conducted the analysis myself.

CHAPTER 2

LITERATURE REVIEW (PREVALENCE AND RISK FACTORS FOR PRENATAL DEPRESSION)

2.1 Introduction

This literature review is carried out in order to analyse the prevalence and risk factors for prenatal depression worldwide with a specific focus on low and middle income countries.

Depression has been labelled an important reason which can lead to illness related disabilities in women (AbouZahr, 2003). Many researchers have concluded that the lifetime prevalence of a major depressive disorder is two times more common in females than males (Noble, 2005a, Kessler et al., 1993). This increased vulnerability of females is observed at an early age and it continues till menopause, indicating that females are more prone to depression during their reproductive years (Kessler et al., 1993, Kessler et al., 2003). Women of child-bearing age are of particular importance because maternal depression has significant impact on the growing fetus, infant, child and family (Rahman et al., 2003b, Rahman et al., 2013b). Perinatal depression encompasses depression during and after termination of pregnancy and it can be defined as "an episode of major or minor depression with an onset either during pregnancy (Prenatal/antenatal depression), or during the first 12 months (postpartum/postnatal depression)" (Mallikarjun and Oyebode, 2005). It is considered to be a serious condition which may have long term negative effects on the mother and the baby.

The most common risk factor associated with perinatal depression is a previous history of depression (Leight et al., 2010, O'Hara, 2013). A young single mother with no social support and chronic illness is also more prone to have perinatal depression (O'Hara, 2013, Szewczyk and Chennault, 1997, Josefsson et al., 2001) Early identification is essential as many studies have concluded that nearly 50 percent of women who suffer from prenatal depression also tend to get postpartum depression (Moses-Kolko and Roth, 2003).

2.2 Types of Perinatal Depression

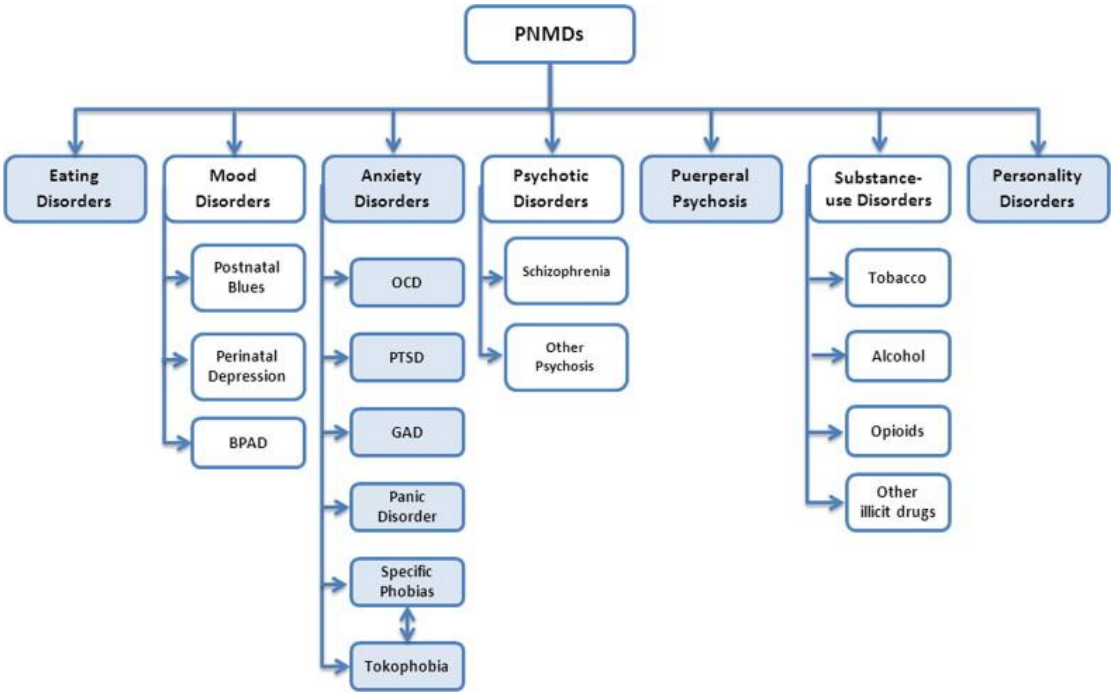

Figure 1: Classification of common Perinatal Mental Disorders (Paschetta et al., 2014)

The above figure shows a summary of common Perinatal Mental disorders. It has been observed that the most common among these are Mood and Anxiety disorders, (Witt et al., 2010, Le Strat et al., 2011) with a higher prevalence in low and middle income countries (Silva et al., 2010, Sawyer et al., 2010, Nasreen et al., 2011, Faisal-Cury et al., 2009, Cook et al., 2010). About 25-35% of pregnant women have enough depressive indicators which meet the criteria for clinical depression (O'hara and Swain, 1996). However, it is quite difficult to distinguish the signs and symptoms of depression from the signs and symptoms of early pregnancy, for example, episodes of low or sad mood, mournfulness, irritability, lack of emotional consistency, nervousness, loss of interest in fun activities, changes in eating habits and sleep deprivation (Altshuler et al., 1998).

As seen in the classification above perinatal depression and bipolar affective disorder (BPAD) fall under “Mood disorders”. As the focus of this study is on prenatal depression which is encompassed within perinatal depression a review of types of perinatal depression is given below followed by detailed review of prenatal depression and its risk factors.

Perinatal depression can occur either during pregnancy or within the first 12 months after delivery. This diagnosis is made if the woman suffers with a consistently low mood along with a fixed number of biological or cognitive symptoms for at least 2 consecutive weeks (Paschetta et al., 2014).

Perinatal depression includes prenatal depression, baby blues, postpartum depression and postnatal (puerperal) psychosis.

2.2.1 Prenatal Depression

Prenatal depression, also known as antenatal depression, is a form of clinical depression that can affect a woman during pregnancy, and can be a precursor to postpartum depression if not properly treated(Lee et al., 2007, Austin and Lumley, 2003). Moreover, women have a greater tendency to suffer from depression during pregnancy than after delivering the baby (Heron et al., 2004, Hobfoll et al., 1995, Johanson et al., 2000). This phase in a woman's life is related to significant physical and emotional changes along with related risks for the onset of a few multifaceted mental issues. Depression during pregnancy has similar presentation as that of depression in a non-pregnant state. American Psychiatric association (APA) has provided a list of signs and symptoms to diagnose major depressive disorder. If five out of nine criteria are met in two weeks, with depressed mood or anhedonia (loss of interest or pleasure) as one of the symptoms, then it is considered to be a case of major depression(Association, 2000b).

Following are the signs and symptoms provided by APA for the diagnosis of depression:-

- Depressed mood most of the day
- Anhedonia (significant loss of interest or pleasure in activities which were previously enjoyable)
- Significant weight loss or gain of more than 5% of body weight in one month
- Psychomotor changes as observed by others (restless, agitated or slow)
- Fatigue or diminished energy levels
- Feelings of worthlessness or inappropriate guilt

- Decreased concentration or indecisiveness
- Recurrent thoughts of death or suicide or attempted suicide (Association, 2000a)

An individual would be diagnosed with minor depression if a minimum of two and not more than five of the signs and symptoms mentioned above are present for a period of two weeks, with one of those symptoms being depressed mood or anhedonia (Association, 2000b, Judd et al., 2005).

2.2.2 The Baby Blues

Baby blues can be defined as "a mild emotional disturbance which starts 3-4 days postpartum and usually remits by the 10^{th} day and is characterized by dysphoria, tearfulness, mood liability, insomnia, irritability and anxiety" (Fossey et al., 1997, O'Hara and Wisner, 2014). This is usually experienced all around the world by 50 to 80 percent of women after labor. The usual signs and symptoms of baby blues comprise yelling, self-pity, undue stress, mood swings, decreased concentration and restlessness (O'Hara and Wisner, 2014). The problem usually does not require any therapeutic intervention but if the matter becomes serious the mothers are then suggested to get medical assistance (Oakley, 1979).

2.2.3 Postpartum Depression

Postpartum depression is "non-psychotic major depression occurring within six months of delivering the baby"(Miller, 2002, O'Hara and Wisner, 2014). Symptoms of this type of depression consist of low temperament for long periods of time, constant irritation, sleep disorder, food disturbances, weariness, inability to gather interest in things, powerlessness to feel pleasure in the day to day activities, guilt, lack of concentration, lack of decision making, feelings of uselessness, despair, or contemplating hurting oneself or the baby (Association, 2000b, O'Hara, 2013). An expected 8 to 15 percent of childbearing women experience post pregnancy anxiety during the first year after the birth of their child(Lee and Chung, 2007) Research has also been able to find that 48% of depressed women can encounter depressive symptoms (Rahman et al., 2004). In Asian countries, the prevalence of postpartum depression was highest (63.3%) in Pakistan and lowest (3.5%) in Malaysia (Klainin and Arthur, 2009). Women encountering these symptoms need prompt mental health assessment as well as treatment.

2.2.4 Postnatal (Puerperal) Psychosis

Postpartum psychosis is the most extreme condition identified with maternal depression that consists of symptoms extending from illusions and distrusts to suicide or murder of the child (Sit et al., 2006, Hatters and Sorrentino, 2011). Due to its serious effects, postpartum psychosis is considered a psychiatric crisis. The condition is rare as compared to other mental issues which tend to influence one to three in 1,000 mothers amid the first year after the child is born (Friedman, 2009). The condition is potentially dangerous and tends to occur frequently, a fact which every mother needs to be mindful of(Stewart, 2007). Another study discovered maternal depression to be the strongest indicator of paternal depression amid the postpartum period, recommending an imperative focus on intervention (Paulson and Bazemore, 2010)

A few studies have observed that women have a greater tendency to suffer from depression during pregnancy **(Prenatal/antenatal depression)** rather than after delivering the baby (Heron et al., 2004, Hobfoll et al., 1995, Johanson et al., 2000). This phase in a woman's life is related to significant physical and emotional changes along with related risks for the onset of a few multifaceted mental issues (Carter et al., 2001). Therefore, the present study mainly focuses on prenatal/antenatal depression which can be a precursor to postpartum depression if not properly treated (Lee et al., 2007, Austin and Lumley, 2003, O'Hara and Wisner, 2014).

2.3 Importance of mental health in pregnancy

Pregnancy is not a simple phase; women have been facing a combination of various experiences while being pregnant (Ross et al., 2004). When pregnancy begins, women instinctively take on the role of motherhood and develop their maternal identity (Ammaniti and Trentini, 2009, Slade et al., 2009). In early stages, mothers tend to experience a phase of disbelief (Lester and Notman, 1988) and eventually the baby becomes the main focus of their feelings and actions. This results in the development of an affiliation with the infant and a desire to rear the child (Slade et al., 2009). After delivery, the mother starts to learn about the baby; she creates maternal affection that relates to the awareness of her baby's requirements along with the ability to react to her newborn's actions and signs (Ainsworth, 1989). She is usually the leader in directing and guiding the mother-child relationship (Brockington, 2004). Healthy mental and

physical condition of the mother is necessary to carry out these activities as mothers who are depressed cannot perform these duties in a proper manner (Leiferman, 2002).

Literature shows that depressed mothers cannot provide proper care, nurturance, protection and incitement to their infants (Rahman et al., 2004). She may not be able to provide essential needs to the child, like nourishment and shelter. The lack of emotional presence of the mother frequently confines her parent-child interactions to negative-based ones, for example, reacting only to her baby's fussing and crying, while dismissing positive signals for communication like smiling (Ko et al., 2012).

It is important to recognize mothers' vulnerabilities during pregnancy as it indicates the necessity for a supportive intervention at that time to help the woman overcome her apprehensions and fears (Ammaniti et al., 2013, Ammaniti et al., 2006, Chandra et al., 2010). Early identification is essential as some studies have concluded that nearly 50 percent of women who suffer from prenatal depression also tend to get postpartum depression (Moses-Kolko and Roth, 2003, Verreault et al., 2014, O'Hara, 2013).

2.4 Public Health Significance of Prenatal Mental Health

Depression during pregnancy has an adverse effect on the social and emotional status of a woman, and it creates doubts in her mind whether or not she will be able to take care of her baby (Murray et al., 2003). Depression has been labelled as an important reason which can lead to illness related disabilities in women (AbouZahr, 2003). Many researchers have concluded that the lifetime prevalence of a major depressive disorder is two times more common in females than males (Noble, 2005a, Kessler et al., 1993). This increased vulnerability of females is observed at an early age and it continues till menopause, indicating that females are more prone to depression during their reproductive years (Kessler et al., 1993, Kessler et al., 2003). About 25-35% of pregnant females have enough depressive indicators which meet the criteria for clinical depression (O'hara and Swain, 1996). However, it is quite difficult to distinguish the signs and symptoms of depression from the signs and symptoms of early pregnancy, for example, episodes of low or sad mood, mournfulness, irritability, lack of emotional consistency, nervousness, loss of interest in fun activities, changes in food intake and sleep deprivation (Altshuler et al., 1998). Women of child-bearing age are

of particular importance because maternal depression has significant impact on the growing fetus, infant, child and family (Rahman et al., 2003b, Rahman et al., 2013b) . Infants born to depressed mothers had lower birth weight, and the relative risk for LBW (<2500g) in infants of depressed mothers was 1.9 (95%CI 1.3–2.9). Maternal depression during pregnancy predicts low birth weight (LBW) (Rahman et al, 2007).

Increasing evidence suggests a large burden and adverse impact of mental illness in the global context and the efficacy and cost-effectiveness of specific treatments and delivery systems in low income countries (Patel et al., 2007; Patel & Thornicroft, 2009). However, a vast majority of people living in low and middle income countries (LMIC) do not have access to these treatments. There is a massive 'treatment gap', which is usually more than 75% in most parts of the world (Kohn, Saxena, Levav, & Saraceno, 2004).

The challenges to implement evidence-based psychological treatment are huge and many barriers have been identified including the lack of skilled human resources, cultural acceptability and appropriateness, poor investments in mental health care and the stigma associated with it (Saraceno et al., 2007). Therefore, regular contact between health professionals (HPs) and women during pregnancy supports the rationale for integrating screening into routine antenatal care (Yelland and Brown, 2014). Evidence from high-income countries and randomized trials from LMI countries shows that psychotherapeutic approaches, such as cognitive behavior therapy, interpersonal therapy, or problem-solving are effective treatments for prenatal depression (Churchill et al., 2002, Patel et al., 2007). However, the problem in LMI countries remains the scarcity of trained mental-health professionals to provide such interventions to underprivileged communities causing a large treatment gap (Saxena et al., 2007, Murray et al., 2013, Eaton et al., 2011).

Systematic reviews in high-income countries show strong evidence that perinatal depression can be managed effectively with psychological treatment (Austin and Priest, 2005, Dennis and Hodnett, 2007). A recent systematic review for low and middle income countries showed the burden of perinatal depression could be reduced through mental health interventions delivered by non-specialists (Rahman et al., 2013a). Keeping this in mind, the South Asian Hub for Advocacy, Research and Education for mental health (SHARE) was founded by the US National Institute of Mental Health (NIMH) to address these challenges. SHARE aims to adapt an evidence-

based intervention, with the title Thinking Healthy Program (THP) originally developed and evaluated in Pakistan (Rahman et al., 2008, Jaskiewicz and Tulenko, 2012, Clarke et al., 2013, Rahman, 2007). THP has recently been adopted by the World Health Organization (WHO) for global implementation (Organization, 2015), and has now been adapted for delivery by peers (called the Thinking Healthy Program Peer-Delivered or THPP) in India and Pakistan, through extensive formative research (Singla et al., 2014).

2.5 Prevalence of Prenatal Depression

According to WHO estimates, by the year 2020 depressive disorders will be the leading cause of global disease burden in women (Organization et al., 2009). A systematic review of 21 studies, carried out in low and middle income countries, reported an overall prevalence of prenatal depression as 10.7 %. A vast majority of research has been carried out in high income countries (Maselko, 2017), however, the available literature suggests higher rates of antenatal depression in low- and middle-income countries (Premji, 2014, Fisher et al., 2012). According to a study conducted in rural Bangladesh in 2011, there was an 18% chance of prevalence of antenatal depression and a 29% chance for antenatal anxiety (Nasreen et al., 2011). Similarly, a 2006 study in Karachi, Pakistan reported a 34% prevalence rate of antenatal depression (Hamirani et al., 2006). While comparing antenatal depression among Pakistani and Canadian women, Mahboob et al. found a higher prevalence of antenatal depression among Pakistani women (48%) than Canadian aboriginal (31%) and Caucasian (9%) women (Shah et al., 2011). These studies used the Edinburgh Postnatal Depression Scale (EPDS) to screen for antenatal depression.

Prevalence of prenatal depression was found to be 25% in a study carried out in rural Pakistan (Rahman et al., 2008). According to various researches conducted previously, the frequency of prenatal depression is either equal or more than postnatal depression (Heron et al., 2004, Hobfoll et al., 1995, Johanson et al., 2000). Prenatal depression prevalence has been estimated from 6.5 to 12.9% over the world with the general predominance of 7.4% during the first trimester, 12.8% in the second, and 12% in the third trimester (Bennett et al., 2004).

In LMI countries, where women are exposed to some of the most extreme psychosocial stress conditions worldwide, such as abject poverty and scarcity of

resources, high prevalence of antenatal stress and depression have been observed (Rwakarema et al., 2015).

A review of literature about the varying rates of maternal depression in Asian countries according to the pregnancy trimester has been provided in table 1.

Table 1: Depression in Asian countries according to Pregnancy Trimester

Trimester	Author	Country	Sample size	Instrument	Cutoff Score	Depressed%
1st	Lee et al., 2007	Honk Kong	332	HADS	≥ 7	22.1
	Caliskan et al., 2007	Turkey	12	BDI	≥ 18	25.0
2nd	Lee et al., 2007	Honk Kong	333	HADS	≥ 7	18.9
	Caliskan et al., 2007	Turkey	24	BDI	≥ 18	25.0
	Lau and Keung, 2007	Honk Kong	2,178	EPDS	≥ 14	9.9
	Glasser et al., 1998	Israel	288	BDI	≥ 10	34.0
3rd	Lee et al., 2007	Honk Kong	333	HADS	≥ 7	21.6
	Caliskan et al., 2007	Turkey	30	BDI	≥ 18	30.0
	Andajani-Sutjahjo et al., 2007	Indonesia	488	EPDS	≥ 12	12.5
	Gulseren et al., 2006	Turkey	125	EPDS	N/A	21.6
	Iranfar et al., 2005	Iran	163	BDI	≥ 10	45.4
	Limlomwongse and Liabsuetrakul, 2006	Thailand	610	EPDS	≥ 10	20.5
	Leung et al., 2005	Hong Kong	385	EPDS	≥ 13	16.6
	Chung et al., 2001	Hong Kong	767	BDI	≥ 15	8.7
Not separated by pregnancy trimester	Kazi et al., 2006	Pakistan	292	CES-D	≥ 16	39.4
	(Chen et al., 2004)	Singapore	382	CES-D	≥ 4	20.0

N/A = information unavailable, HADS = Hospital Anxiety and Depression Scale, EPDS = Edinburgh Postnatal Depression Scale, BDI = Beck Depression Inventory, CES – D= Center for Epidemiology Studies Depression Scale

During the previous decade, researchers in Asia started to take more interest in determining the rates of prenatal depression. They found higher rates of prenatal depression while using self-reporting questionnaires, "Hospital Anxiety and Depression Scale" (HADS), "Center for Epidemiologic Studies Depression Scale" (CES-D), "Edinburgh Postnatal Depression scale" (EPDS), and "Beck Depression Inventory" (BDI), as compared to when using structured clinical interviews. A systematic review was carried out by Roomruangwong et al in 2011 and they found sixteen studies which assessed the prevalence of depression by using these self-reporting questionnaires. In the above mentioned studies, the prevalence of depression

varied from 8.7% in Hong Kong (using BDI score 15) to 45.5% in Iran (using BDI score > 10).

We can also observe that even when the studies were carried out in the same country (Hong Kong) with a similar study population, there was a significant difference in prevalence of prenatal depression because the study conducted by Leung et al in Hong Kong in 2005 used EPDS and percentage of prenatal depression in third trimester was found to be 16.6% (Leung et al., 2005), whereas Lee et al calculated the percentage of prenatal depression as 21.6% using HADS (Lee et al., 2007). The difference observed can be attributed to the different methods used by both studies.

The prevalence of prenatal depression according to pregnancy trimester in South Asian countries is summarized in Table 2.

Table 2: Prenatal depression Prevalence studies in South Asia

Study	Time period	Sample size	Instruments	Prevalence
Urban Karachi, Pakistan Kazi et al., 2006	Antenatal visits	Hospital based sample of 292	CES-D Cut off ≥16	39.4%
Rural Gilgit Pakistan Shah et al., 2011	Pregnancy	Community sample of 128	EPDS Cut off ≥13	48.4%
Rural Bangladesh Gausia et al., 2009	3rd trimester	Community sample of 361	EPDS Cut off ≥10	33%
Rural Rawalpindi Pakistan Akhtar et al., 2010	3rd trimester	Community sample of 325	SRQ Cut off ≥7	56%
Hyderabad Pakistan Karmaliani et al., 2009	20–26 weeks pregnant	Community sample of 997	AKUADS > 31.5 How I feel scale > 83.5	11.5 % 13.5%
Kahuta Pakistan Rahman et al., 2003b	3rd trimester, 10-12 weeks postpartum	Community based sample of 632	SCAN	25% AND 28% PND
Tamil Nadu, India Chandran et al., 2002	3rd trimester, 6-12 weeks postpartum	Community based sample of 359	CIS-R	11% incidence PND; 16% AND,

AKUADS: Aga Khan University Anxiety and Depression Scale, AND: Antenatal Depression, CES-D: Centre for Epidemiological Studies – Depression, CIS-R: Revised Clinical Interview Schedule, EPDS: Edinburgh Postnatal Depression Scale, PND: Postnatal Depression, SCAN: Schedule for Clinical Assessment in Neuropsychiatry, SRQ: Self-Reporting Questionnaire

It can be observed in table 2 that prevalence of prenatal depression in Pakistan, India and Bangladesh through self-reported screening instruments is high as compared to those with diagnostic interviews. This is also supported by research in other parts of the world (Steel et al., 2009)**.** The large variation between the prevalence estimates have been attributed to different instruments with variable cut off scores; variable assessment

period; and other socio demographic differences between the research settings(Fisher et al., 2012). However, PHQ-9, though a self-reporting questionnaire, has been found to be consistent with “SCAN” and “EPDS” (Yawn et al., 2009, Zhong et al., 2014, Löwe et al., 2003). Epidemiological studies carried out in low and middle-income countries have shown higher prevalence of depression among pregnant women in Asian countries regardless of the trimester (Roomruangwong and Epperson, 2011a). Likewise, a survey carried out in a tertiary care hospital in Mumbai found that prevalence of depression during pregnancy was found to be 9.18% based upon BDI (Ajinkya et al., 2013). It can be explained by the fact that most such studies were conducted on women who came for their prenatal checkups (Fisher et al., 2012). A study carried out in a rural area near Kahuta, Pakistan, concluded that 28% of women suffered from prenatal depression (Rahman et al., 2003b).

In 2008, a study carried out in Birmingham concluded that prevalence of prenatal depression in women of Asian descent was quite high (Dhillon and MacArthur, 2010). The research included information from migrants of Asian origin like Pakistan, India and Bangladesh. In Canada, lifetime prevalence of depression among women is 12.3% (Bowen and Muhajarine, 2006) and females tend to suffer from first major episode of depression during their antenatal period (Organization, 2002). Various studies have found prenatal depression to be quite prevalent in Pakistan (Naeem, 2002, Husain et al., 2000, MUMFORD et al., 2000a). In another study carried out in Hyderabad, Pakistan, 18% of pregnant women were found to be either anxious or depressed (Karmaliani et al., 2009).

Similarly in a recent systematic review and meta-analysis, Fisher and colleagues (Fisher et al., 2012) identified 13 studies which had investigated common mental disorders prevalent in pregnant women from 1979 till 2010. Five out of the 13 studies were done in tertiary hospitals, a further five investigated community based services, and only three studies recruited participants from the general population through community health workers or through established system of surveillance of the general population of pregnant women. The average prevalence of common mental disorders in pregnancy across all settings was 15.6% (95% CI: 15.4 to 15.9). However, after segregation of the prevalence data according to setting, higher weighted mean prevalence was found for community based studies i.e. 19.7% (95% CI: 19.2 to 20.1).

2.6 Prenatal Depression in Pakistan

In Pakistan, pregnancy is usually associated with cultural stigmas revolving around issues related to gender discrimination, abnormal births and genetic abnormalities. It is also associated with several psychiatric problems in women, mainly depression and anxiety (Waqas et al., 2014). A number of studies have found high prevalence of depression among Pakistani women (Husain et al., 2000, MUMFORD et al., 2000a, Ali et al., 2012).

The high pervasiveness of prenatal depression in Pakistani women is a matter of concern. Prenatal depression has been connected with low conception weight and poorer wellbeing in kids (Stein et al., 2014, Wado et al., 2014, Yang et al., 2016, Broekman et al., 2014, Saeed et al., 2016b). In Pakistan, social standards, social practices, and association with in-laws may assume a key part in women's mental wellbeing (Gulamani et al., 2013). Lack of autonomy has also been identified as an important predictor of antenatal depression among Pakistani women (Zahidie and Jamali, 2013).

Illiteracy has been discovered to be a strong variable that adds up to prenatal depression (Kitamura et al., 2006), along with physical abuse among Pakistani females (Karmaliani et al., 2009, Ali et al., 2012). This finding was observed in different studies as well that had indicated high commonness of prenatal depression among pregnant women exposed to physical violence (Lee et al., 2004, Shah et al., 2011, Gausia et al., 2009, Kumar et al., 2005).

Table 3: Studies related to Prevalence of Prenatal Depression in Pakistan

Author &Year	Design	Setting	Sample size	Assessment time	Tool	Prevalence
Humayun et al., 2013	Cross sectional study	Teaching Hospital Lahore	506	Prenatal	*EPDS > or = 10	65%
Ali et al., 201	Cross sectional study	Aga Khan University Hospital, Karachi	165	Prenatal	*HADS≥8	16.8%
Shah et al., 2011	Cross sectional survey	Gilgit Baltistan Communit y study	128	Prenatal	*EPDS >=13	48.8%
Zahidie et al., 2011	Cross Sectional study	Rural setting of Sindh	375	Prenatal	*CES-D	62%
Husain et al., 2011	cohort	Clinic setting in Karachi	1365	Prenatal 3rdtrimester and postnatal	*EPDS >=13	38.3 % & 25.8%
Asad et al., 2010	Cohort	Communit y Hyderabad Sindh	1,369	Prenatal 2nd trimester	*AKUADS SF >=13	18%
Imran and Haider, 2010	Cohort	Hospital setting in Lahore	213	Prenatal 3rd trimester	*EPDS >=12	42.7%
Karmaliani et al., 2009	Cross sectional (part of a prospecti ve study)	Semi urban community Hyderabad	1,368	2nd trimester	*AKUADS >=13	18%
Karmaliani et al., 2007	Validity study	Civil Hospital Hyderabad	200	Prenatal	*AKUADS How I feel scale	40% 47%
Hamirani et al., 2006	Cross sectional study	Abbasi Shaheed Hospital, Karachi	75	Prenatal (2nd and 3rd Trimester)	*EPDS > = 12	34.6%

The above table reveals that the prevalence of prenatal depression in Pakistan ranges from 11.5% to 75%. The varying prevalence of prenatal depression could be due to a variety of reasons, including different settings, populations selected for study, sample sizes, measurement instruments used and their cut-off values, timing of administering the tools and data collectors being mental health specialist or not.

These studies have been conducted in different provinces of Pakistan which are different from each other culturally, economically, in health indicators and women

related factors like their autonomy, education and social support. As seen here, most of the studies are conducted in the province of Punjab and Sindh which are the largest of the provinces. Moreover, the study was conducted in hospitals or clinics which did not represent the general population. The largest rural community-based study (Rahman et al., 2007) collected data on 701 prenatal women which was a representative sample.

One can infer from the above argument that there are varying rates of depression in different settings in Pakistan. However, the rates are on the higher side hence there is a need to know the risk factors for this problem.

2.7 Risk Factors of Prenatal Depression

There are various factors which have an impact on maternal mental well-being and which may ultimately lead to prenatal depression (Leigh and Milgrom, 2008). Much work has been done to determine the risk factors which may be responsible for prenatal depression. Some of the studies conducted in developing countries have been listed below in Table 4 and 5.

Table 4: Socioeconomic and demographic risk factors for maternal depression in developing countries

Study area	Author	Methodology	Risk factors
Eastern Turkey	(Inandi et al., 2002)	Multi-centre; Hosp based; 2514 women; EPDS	• "Poverty" • "illiteracy" • "poor family relations" • "low marital age" • "mental health problems" • "three or more daughters"
Western Turkey	(Esen Danaci et al., 2002)	Multi-centre; Hosp based; 257 women; EPDS	• "number of children" • "being an immigrant" • "serious health issues of baby" • " psychiatric history" • "bad relations with in-laws"
Tamil Nadu, India	(Chandran et al., 2002)	Community based; 359 women; CIS-R; ICD-10 criterion	• "low income" • "life events preceding yr. of delivery" • "problems with mother-in-law" • "poor relation with parents" • "birth of daughter when son was desired" • lack of physical help at home
Goa, India	(Patel et al., 2002)	Hospital based; 270 women; GHQ; EPDS	• "poor marital relationship" • "birth of female child" • "marital violence" • "poverty" • "low education" • "antenatal depression"
China	(Xu et al., 2003)	Hospital based; 1597 women; HAD, EPDS	• "antenatal depression" • "antenatal anxiety" • "postpartum physiological changes" • "negative personality"
Pakistan	(Irfan and Badar, 2003)	Multi-center; Hosp based; 1248 women; case register diagnosis	• "being young" • "illiteracy" • "past psychiatric history" • "being a house wife" • "living in rural areas" • "poverty" • "husband away for job etc"
Singapore	(Chen et al., 2004)	Hosp based; 487 women; CES-D	• "being young" • "history of smoking" • "frequent use of alcohol" • "past/current obstetric complication" • "medical problems" • "more daughters"
Southern Kahuta, Pakistan	(Rahman et al., 2003b)	Community 632 women; SCAN;	• "adverse life events in the year before pregnancy" • "illiterate husband" • "husband's unemployment" • "two or more daughters"
Hong Kong, China	(Lee et al., 2004)	Hosp based; 959 women; EPDS	• "conflict with mother-in-law" • "marital dissatisfaction" • "past history of depressive illness"

The above mentioned studies indicate that the risk factors of greatest importance during pregnancy are psychosocial in nature. Many other studies have also identified psychosocial causes for depression among women (Rabbani et al., 2008a, Husain et al., 2004, Riso et al., 2002, Husain et al., 2000, MUMFORD et al., 2000b) along with a previous history of depression (Leight et al., 2010) Important risk factors in Pakistan were identified as young age, illiteracy, past psychiatric history/ depression, being a housewife , poverty and the husband away from home (Irfan and Badar, 2003).

Asia is the world's largest continent and contains more than 60% of the world's current population (https://www.statista.com › Society › Demographics). This continent has a range of diverse cultural groups. Asian people in general and Pakistani society in particular have more conservative points of view on reproduction, the role of women, and the nature of mental disorders (Yoo, 2001, Kazi et al., 2006, Ahrold and Meston, 2010). The table below shows the factors related to prenatal depression ,which is based on review of 86 studies from Asian countries (Roomruangwong and Epperson, 2011b).

Table 5: Factors related to maternal depression in Asian countries

Factors	**Hong Kong**	**Turkey**	**Indonesia**	**Pakistan**	**Japan**	**Thailand**	**Singapore**	**Lebanon**
Individual Factors Age	✓			✓ b	✓	✓ a	✓ a	
Education				✓				
Having medical problems							✓	
Past history of psychiatric illness	✓	✓					✓	✓
Familial history of psychiatric illness	✓	✓						✓
Smoking/alcohol use							✓	
Household work				✓			✓	
History of premenstrual symptoms	✓					✓		✓
Husband/marital relationship factors Uneducated husband				✓				
Husbands unemployment			✓					
Marital conflict	✓		✓	✓				
Lack of support from husband			✓					✓
Poor quality of sexual relationship								✓
Pregnancy related factors Unplanned/unwanted pregnancy	✓						✓	✓
Premarital pregnancy			✓			✓		
Pregnancy related concerns				✓				
Negative attitude towards current pregnancy					✓	✓		
Pregnancy symptoms				✓				
Past history of obstetrics complication (s)							✓	
Current obstetrics complications							✓	✓
Other psychosocial factors - In-laws conflicts	✓			✓				
Adverse life event (s)		✓		✓				
Illness in the family			✓					
Lack of support from family networks			✓	✓			✓	
Significant other made redundant				✓				
Financial difficulties			✓	✓				✓
Having many children				✓				

Lack of confidant or friend				✓				
Perceived potential							✓	
Conflicts with relatives over childcare								

a = young age, b = older age (Roomruangwong and Epperson, 2011a)

As seen in the table above, the factors which are most associated with prenatal depression in Asian countries have been differentiated into four categories. These have been identified as individual factors, husband marital relationship factors, pregnancy related factors, and other psychological factors. Pakistani women face nearly all of the above stated risk factors as compared to the rest of the Asian countries. Turkey, Japan and Thailand have a favorable environment as compared with Hong Kong, Indonesia, Singapore and Lebanon.

The above mentioned risk factors along with some other important risk factors will be discussed further in detail.

2.7.1 Individual Factors

As observed in the table above, among the individual factors, young age, illiteracy and past psychiatric history may play a significant role in occurrence of prenatal depression. Although two of the studies in table 5 indicate a relationship between illiteracy and prenatal depression (Irfan and Badar, 2003, Inandi et al., 2002), a study undertaken by Rahman et al could not find any such association (Rahman et al., 2003b).Young maternal age and getting pregnant before the age of 20, has been associated with prenatal depression (Rich-Edwards et al., 2006, Leigh and Milgrom, 2008, Stewart, 2011). However, older maternal age has been associated with less satisfaction with life and consequently depression during pregnancy (Aasheim et al., 2014). A study carried out by Mattei et al found that in women, BMI does have a role in predicting the onset of depression (Mattei et al., 2015).The association between high pre-pregnancy BMI and poor mental well-being among pregnant women has been observed in many other studies as well (Kulie et al., 2011, Molyneaux et al., 2014, Furber and McGowan, 2011, Rohrer and Rohland, 2004)

If a woman has a genetic predisposition towards depression, pregnancy can further influence the problem (Noble, 2005a). Likewise, a past history of maternal depression can anticipate future events of depression in the prenatal period (Cohen et al., 2006, Faisal-Cury et al., 2004, Gausia et al., 2009, Hanlon et al., 2009,

Limlomwongse and Liabsuetrakul, 2006, Patel et al., 2002). Many other studies have also concluded that many risk variables for prenatal depression incorporate past account of depression (Leigh and Milgrom, 2008, Lee et al., 2007, Lancaster et al., 2010b, Melville et al., 2010).

Historically, pregnancy was thought to be protective against mental problems (Zajicek, 1981, Kendell et al., 1987). However, in a later study, hormonal as well as chemical fluctuations faced by women in the prenatal period have been identified as having a significant role in maternal depression (O'Hara, 2013). A woman who has gone through abortion or is going through an unplanned pregnancy period is also at a greater risk of facing prenatal depression (Pedersen, 2008). Some other risk factors could be getting pregnant as a single mother, maltreatment as a child, smoking, alcohol use before and after pregnancy and having more than three or four children (Donna E. Stewart, October 27, 2011, Deidre Ryan August 2005).

2.7.2 Family Relations/Social Support

An association of Prenatal depression has been found with low social support (Dayan et al., 2010, Westdahl et al., 2007, Leigh and Milgrom, 2008) and social conflict (Westdahl et al., 2007).

Studies show that the relationship with the spouse plays an important role in pregnancy outcome (Glover, 2014, Yazdanpanah et al., 2015, Pajulo et al., 2001). Women with higher social support especially from the spouse or a close family member have more antenatal visits which in turn gives more information regarding diet and care during pregnancy (Maharlouei, 2016). A young single mother with no social support and chronic illness is also more prone to have prenatal depression (O'Hara, 2013, Szewczyk and Chennault, 1997, Josefsson et al., 2001).

Different indicators are connected with prenatal depression such as substance abuse, family violence, negative cognitive style, conflicting thoughts about the pregnancy, unsound financial status, and history of abuse (Hobfoll et al., 1995, Tareen, 2000). Traumatic encounters with in-laws and substance abuse may cause stress in an expectant mother and could ultimately lead to prenatal depression (Webster-Stratton and Hammond, 1988, McCue Horwitz et al., 2007, Schetter and Tanner, 2012). This can also be due to lack of healthy surroundings for the mothers, for example, absence of nourishment, inadequate housing facilities, minimal financial backing, and lack of

family support where the husband or partner remains uninvolved and emotionally distant (Hung and Chung, 2001, Leahy-Warren et al., 2012). A few studies carried out in Pakistan observed that absence of the husband from home for periods longer than six months could be a risk factor for prenatal depression (Rahman, 2007, Husain et al., 2011).

Mothers can additionally become weak against depression without group and community support (Crnic et al., 1983). A study concluded that the dynamics of the migration experience have served as both protective as well as a risky variable for the mental wellbeing of the mother (Austin et al., 2005).

Social support is one of the most important and neglected factors which is responsible for prenatal depression (Westdahl et al., 2007, Pajulo et al., 2001). It is quite difficult to assess absence of social support in depressed pregnant women as they tend to feel less support by people around them (Robertson et al., 2004). Such observations, regarding absence of perceived social support, have also been made by some other studies in Nigeria, Canada and Ethiopia as well (Adewuya et al., 2007, Bayrampour et al., 2015, Dibaba et al., 2013), identifying less perceived social support as a risk factor for depression among pregnant women. A few studies carried out in Pakistan also came to the conclusion that availability of social support can predict the occurrence of depression among pregnant women (Kazi et al., 2006, Farid et al., 2008).

An old study, conducted in 1986, had found that women who are supported by their families, especially husbands, develop less depression during prenatal and postnatal period (O'Hara, 1986). The same findings were observed in the latest study as well showing that social support to women is associated with decreased odds of experiencing IPV and therefore less depression during pregnancy (Sigalla et al., 2017). Women who received effective partner support in terms of relationship quality, emotional support, intimacy in their relationship and equality showed less anxiety and depression in mid and late pregnancy (Rini et al., 2006). Women who believed that their husbands and family are not happy with the pregnancy were more likely to develop depression during antenatal period, in other words women with less emotional support during pregnancy are more likely to develop depressive symptoms (Kanotra et al., 2007).

Despite the fact that interventions are being developed to cope with prenatal depression (Rojas et al., 2007), their effectiveness is limited in low and middle income countries due to poverty, lack of social support and lack of women empowerment as most of them are financially dependent on their husbands (Rahman and Creed, 2007, Kermode et al., 2007). Similar findings were also observed by another study which identified that lack of freedom is an important predictor of antenatal depression among Pakistani women (Zahidie and Jamali, 2013). Women who have earnings of their own have more self-confidence, an increased say in family decisions and have more authority over family assets(NIPS, 2012).

2.7.3 Intimate Partner Violence and Husband/Marital Relationship

Intimate partner violence (IPV) means physical, psychological, and sexual abuse conducted by the husband or an intimate partner (Beydoun et al., 2012). It is a significant public health issue and the most common form of violence against women worldwide (Izaguirre and Calvete, 2014). In a prospective cohort study carried out in the Kilimanjaro Region, Tanzania, the prevalence of IPV during pregnancy was found to be 30.3% where the majority (29.0%) experienced repeated episodes of abuse (Rogathi et al., 2017). According to WHO, 30% of women in relationship with a man (husband or intimate partner) suffer physical or sexual violence all across the world (Organization, 2013). In a study carried out by Mezey et al association of prenatal depression was found with domestic violence (Mezey et al., 2005, Rodriguez et al., 2008). However, only psychological abuse in absence of physical or sexual abuse can also have a negative impact on the mental health status of the pregnant woman (Tiwari et al., 2008)

An estimated 15-20% of women in United States (Breiding, 2014) and more than 20% of women in United Kingdom experienced IPV (Khalifeh et al., 2013). A meta-analysis from 92 developed and developing countries came to the conclusion that prevalence of IPV is the lowest in China (4.8%) and highest in Brazil (63.4%) (James et al., 2013). A study carried out in Maharashtra, India, showed that 35.9% of the study population reported physical and 31.7% reported sexual abuse by their husbands (Reed et al., 2016). In Bangladesh, 40-70% of women suffer from IPV on an average (Bhuiya et al., 2003, Naved et al., 2006, Bates et al., 2004).

In a cross sectional survey published by Rubeena et al in January 2012, it was observed that out of 373 women 75.9% reported severe psychological, 34.6% reported severe sexual and 31.9 % reported severe physical violence at least once in marital life (Zakar et al., 2012). Similarly, half of the study population in Karachi, Pakistan was found to have been either physically or psychologically abused (Farid et al., 2008) Women also experience violence by their husbands or intimate partners despite being pregnant (Fikree et al., 2006). In a study carried out in Hyderabad, Pakistan, it was seen that 51% of women reported to have undergone verbal, physical or sexual abuse in the six months before and/or during pregnancy (Karmaliani et al., 2008). According to some studies, pregnancy itself can be a risk factor for intimate partner violence for women all over the world (Islam et al., 2017, Devries et al., 2010, Khalifeh et al., 2013, Kendall-Tackett, 2007, Garcia-Moreno et al., 2006).

Risk factors associated with physical and psychological violence are a less educated husband who is usually an unskilled laborer and more than five persons living in the same household. For sexual violence, being uneducated and having a low socio-economic status were found to be important risk factors which should be taken into consideration (Ali et al., 2011).

A study, carried out by Langdon et al in 2014, concluded that intimate partner violence (IPV) can have increasing adverse effects on the mental health of victims in comparison with those who have never experienced IPV. An association was observed between IPV and depression, and the severity and extent of intimate partner violence can result in worsening of mental health (Lagdon et al., 2014). Women who suffered intimate partner violence at least once in their lifetime underwent significant emotional distress (Ellsberg et al., 2008b).

2.7.4 Socio-economic and Demographic Factors

There is a strong inverse relationship between lower social class and psychological distress or disorders (Osler et al., 2015, Lund et al., 2010, Lund, 2012). Discrimination on the basis of education, social class and race are main stressors in this respect (Stansfeld et al., 2011). Most of the women living in poverty can develop depressive symptoms which is associated with poor social environment, negative life events and eventually poor infant outcome (Barbier, 1987, Zuckerman et al., 1989, Belle Doucet, 2003, Simmons et al., 2008). These stressors have direct and indirect

effects on pregnancy. Direct effects are related to poor outcomes of pregnancy such as growth retardation and preterm delivery and indirect effects because of smoking, increased alcohol intake and malnutrition result in fetal growth retardation(Hoffman and Hatch, 1996).

While looking into the socio demographic factors, significant differences were observed in prevalence of prenatal depression in rural and urban settings, especially in the developing countries. In a study carried out by Waqas et al in Pakistan, the prevalence of prenatal depression and anxiety among rural women was found to be significantly more than urban and semi urban women (Waqas et al., 2015). This can be explained by the fact that in rural Pakistan there is a lack of basic facilities like clean water, appropriate housing, gas, electricity, education and health facilities (Rahman et al., 2011).

Women also suffer from gender discrimination, especially in rural areas (Waqas et al., 2014, Mian et al., 2016) where they are less independent and are less involved in decision making (Waqas et al., 2015). Two separate studies carried out in Sindh, Pakistan looked into the prevalence of prenatal depression in urban and rural settings. The prevalence of prenatal depression was found to be higher (60%) in the rural study population (Zahidie et al., 2011) as compared to 39.4% in the urban study population (Kazi et al., 2006). In another study conducted by Husain et al., it was found that the reasons for the increased prevalence pf prenatal depression in rural areas are lack of basic infrastructure of health care, lack of education and higher level of poverty (Husain et al., 2011).

2.7.5 Maternal Diet

Depression and diet might be related (Ouwens et al., 2009). Some preliminary research suggests that poor diet can make a woman more vulnerable to depression (Hidaka, 2012). A study analyzing the association between diet and depression using an overall diet approach highlights that participants in the highest tertile of the whole food pattern had lower odds of depression (OR = 0.74, 95% CI 0.56–0.99) than those in the lowest tertile. Contrarily, the high consumption of processed food was associated with increased odds of depression (OR = 1.58, 95% CI 1.11–2.23) (Akbaraly et al., 2009). Food insecurity may lead to poor dietary intake which may in turn lead to maternal depression (Hromi-Fiedler et al., 2011). In another study conducted by Brenda

et al, it was concluded that pregnancy can cause depletion of nutrient reserves resulting in an increased risk of prenatal depression (Leung and Kaplan, 2009). However, poor diet quality can be a modifiable risk factor during pregnancy (Bodnar and Wisner, 2005).

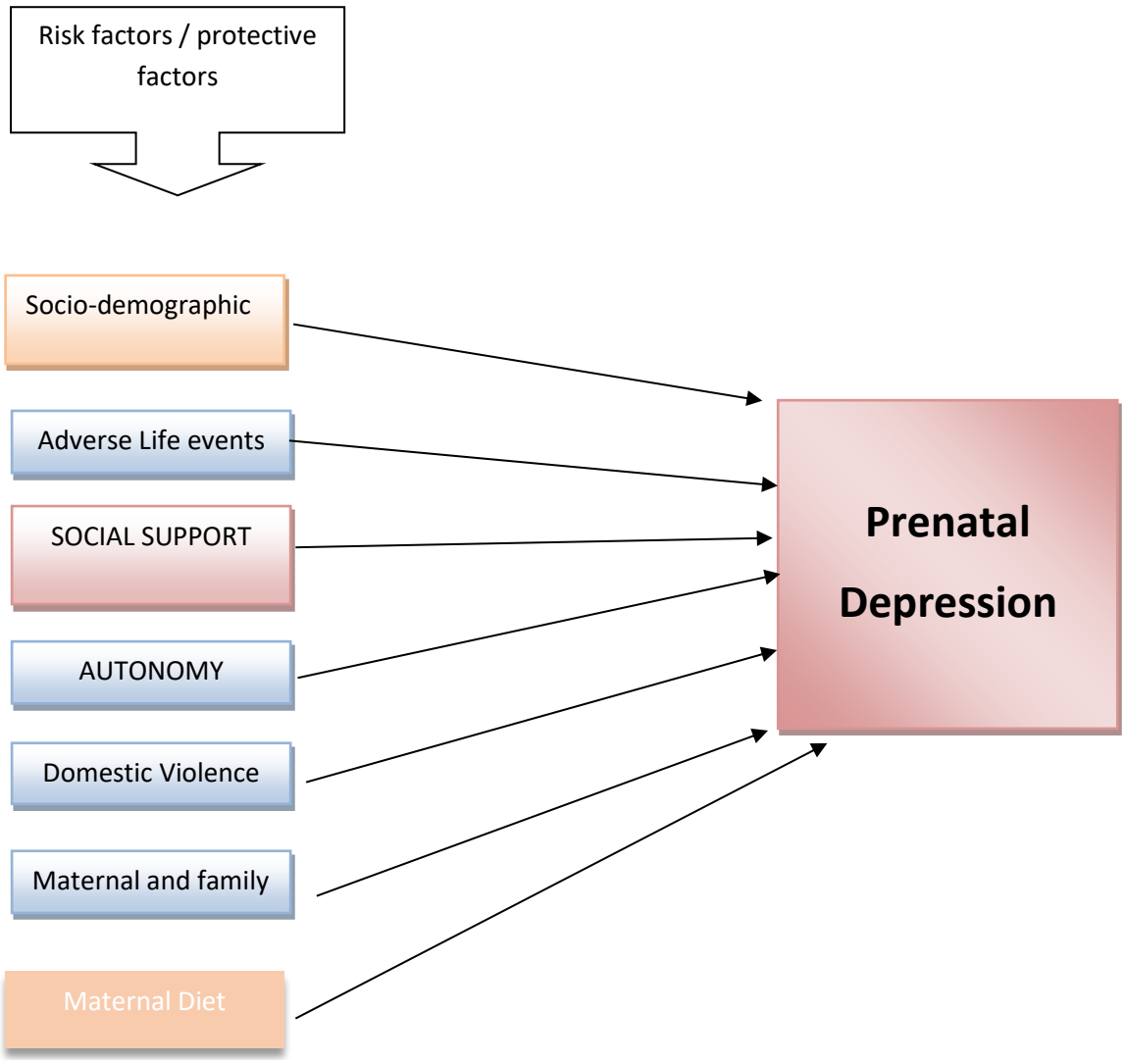

Figure 2: The study framework

(the risk factors/protective factors for prenatal depression)

2.7 Summary

In this chapter an attempt has been made to highlight the importance of mental health during pregnancy. Perinatal depression encompasses prenatal depression, baby blues, postpartum depression and postnatal (puerperal) psychosis, however, the primary focus of this study is on prenatal depression, its prevalence and the associated risk factors.

Prenatal depression prevalence has been estimated to be 7.4% during the first trimester, 12.8% in the second, and 12% in the third trimester. Epidemiological studies carried out in low and middle-income countries have shown higher prevalence of depression among pregnant women in Asian countries with 25% prevalence among Pakistani women. Among the various risk factors, young age, illiteracy, psychosocial issues, being a housewife, living in rural areas, poverty, intimate partner violence, lack of social support and lack of autonomy were found to be significant in Pakistan. Some studies have been carried out on diet and depression in general, but those were either not specific for pregnant women or they looked into just one nutrient. Based on the literature a framework was proposed for the study.

CHAPTER 3

AIM AND OBJECTIVES

The present research is aimed at determining the prevalence of prenatal depression and its risk factors, and exploring the relationship of prenatal depression with the dietary intake in a representative sample of women in the second and third trimester of pregnancy.

3.1 Objectives

1. To determine the prevalence of prenatal depression in women living in Kallar Syedan, sub-district of Rawalpindi, Pakistan.

2. To study the association of prenatal depression with socioeconomic, demographic, stressful life events, perceived and available social support, autonomy/decision-making and intimate partner violence among women living in Kallar Syedan, Rawalpindi, Pakistan.

3.2 Hypotheses

Null Hypothesis: There is no association between prenatal depression and stressful life events, social support, decision making, autonomy, intimate partner violence and socio demographic factors.

Research Hypothesis: There is an association of prenatal depression with socio-demographic factors, stressful life events, perceived and available social support, decision making /autonomy and intimate partner violence with prenatal depression.

CHAPTER 4

METHODOLOGY

4.1 Introduction

This study was conducted at the baseline assessment of a stratified cluster randomized controlled trial-SHARE (South Asian Hub for Advocacy, Research and Education for mental health). SHARE aims to adapt an established evidence-based intervention, the Thinking Healthy Program (THP) originally developed and evaluated in Pakistan (Rahman et al., 2008, Rahman, 2007, Organization, 2015).

This chapter describes the study area, study population, operational definitions and the process of obtaining the sample for the study. This is followed by epidemiological arguments for selection of an observational cross sectional design to study the association between prenatal depression and dietary intake. The instrument used for screening prenatal depression among pregnant women is also discussed. An account of other variables studied and procedure of data collection is described. Finally, sample size estimation and the methods of statistical analysis adopted for this study are described.

4.2 Study Site

The study was carried out in Kallar Syedan, one of the 7 Tehsils of the district Rawalpindi in Province of Punjab, Pakistan. On 1 July 2004 Kallar Syedan became the seventh Tehsil of Rawalpindi District, prior to which it was a part of the Kahuta Tehsil. A Tehsil is an administrative division, an area of land with a city or town which serves as its administrative center with possibly more towns and a number of villages.

According to the District Census Report of Rawalpindi (1998), the Tehsil has a population of about 190,000 and consists of 11 Union Councils; Nullan Muslmanan, Minyada, Bishondot, Guff, Ghazanabad, Kanoha, Smoot, Kallar Syedan, Drakali Mamuri, Sokot, Choha Khalsa. A union council is the smallest rural administrative unit consisting of 10 to 15 villages. The average household comprises of 6.2 members. Most households depend on farming, supported by earnings of one or more adult male members serving in the armed forces, or working as government employees, semi-skilled, or unskilled laborers in the cities. Role of women in the area is to perform

household chores as well as farming activities. A woman has a very tough daily routine which starts before sunrise and continues till late in the evening. Their work is unpaid and is not considered a paying job.

Pakistan's national language is Urdu, which, along with English, is also the official language. The study population is not only well conversant in Urdu; they could read and write it as well. However, Potohari (a local dialect) is also spoken but is not used in the written form. The sub-district is representative of a typical low-socioeconomic rural area of northern Punjab province of Pakistan. Male and female literacy rates are 80% and 50% respectively. Infant mortality rates are 74 per 1000 live births (PDHS 13-14).

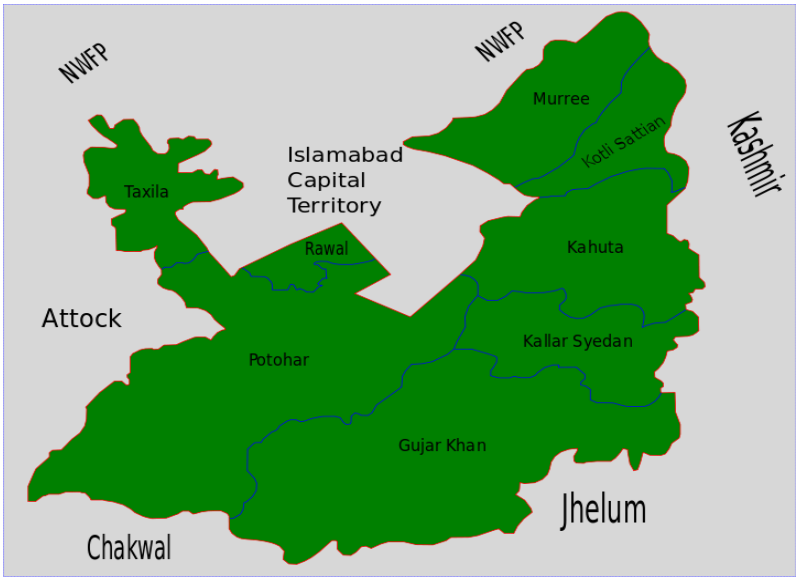

Figure 3: Map of district Rawalpindi & sub-districts

The school enrolment rate (proportion, as percentage, of students in the population aged 5-24 years) for rural population is 60% for males and 50% for females. Educational facilities i.e. schools are available for both boys and girls. Most of the population has benefited from public schools; however some private sector institutions are also there. But post-school education facilities are not available in Kallar Syedan.

Each union council has about 10-15 villages of varying sizes and a population of approximately 10,000-15,000. In every union council there is a Basic Health Unit (BHU) which has a work force of a primary care physician, a midwife called Lady Health Visitor (LHV), a vaccinator, and a set of Lady Health Workers (LHWs) along with their supervisor called Lady Health Supervisors (LHSs). The LHWs provide health

education and basic maternal and child health care through monthly home-visits. Each LHW caters to about 100-150 households within her catchment area based on approximately, 1200-1500 of the population. Lady Health Workers keep a register of every new pregnancy in their area. For the current study, village clusters were chosen, each having a population of approximately 2500 to 3600 (this could be either one village or more than one smaller villages located near each other). Figure 4 shows the flow of districts to village clusters.

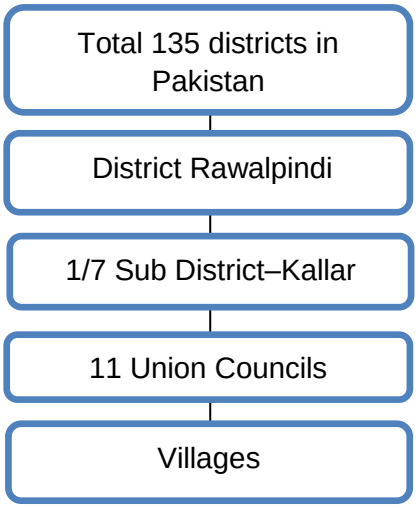

Figure 4: Administrative structure: Districts to village cluster

This area was selected for a number of methodological and logistic reasons as it is geographically, culturally and socio-economically homogenous. Its proximity to major cities and towns (Rawalpindi, Islamabad, Gujar Khan) means that the area is relatively better developed than the more inaccessible rural areas of the country. In recent history there have been no food shortages; this was important to preclude the possibility of epidemic malnutrition due to deficient food supply.

There is also reasonable health facility coverage in the study area. In 11 Union councils (UCs) of Kallar Syedan, there are 9 Basic Health Units (BHUs) having a Male or Female Doctor, 1-2 Lady Health Visitors (LHVs)/midwives, and a Vaccinator. There is one Tehsil Headquarter Hospital (THQ), where medical officers, medical, surgical and Gynae/Obstetric specialists as well as LHVs, midwives and vaccinators are posted. A total of 11 LHVs/ Midwives are available in 9 Basic Health Units (BHUs) and 5 in Tehsil Headquarter Hospital (THQ). There are 9 vaccinators in 9 Union councils (UCs)

and 7 nutrition supervisors in the Tehsil. There are 122 Lady Health Workers (LHWs) in the area (Zaidi et al., 2013). This ensured that, through them, we had access to pregnant women under their care.

4.3 Operational Definitions

Pregnancy: It is defined as "the state of carrying a developing embryo or fetus within the female body" or "the period from conception to childbirth" (Moore et al., 2011).

Prenatal Depression : Having a score of $\geq$ 10 as measured by a screening tool the "Patient health questionnaire" (PHQ9), as used in SHARE study protocol in Pakistan and India (Sikander et al., 2015).

4.4 Study Population

The target population included all pregnant women in their second and third pregnancy trimester (4-9 months of pregnancy), living in the study area, which were on the register of their respective LHWs.

4.5 Inclusion and exclusion criteria

4.5.1 Inclusion Criteria

Pregnant women, aged 18 and above, registered with LHWs in their second or third trimester, who intended to stay in the study area for at least one year, were included in the study.

4.5.2 Exclusion Criteria

Pregnant women who needed immediate inpatient care for any reason (medical or psychiatric) and/or those who could not speak Urdu, Punjabi or Potohari language were excluded.

4.5.3 Identification of Eligible Women

As mentioned above, each Union Council has 15-20 LHWs. They are women from the local community who have completed secondary school education (ten years of education), and are trained mainly to provide preventive mother and child healthcare and education in an assigned local catchment area (of about 1200-1500 population) The LHWs live in the same villages where they provide services, under the supervision of LHS (Wazir et al., 2013).

Independent evaluations of the LHW Programs estimate that they cover 85% of the households on an average, and register a similar proportion of pregnant women from the total population of the Union Council they cover (Hafeez et al., 2011). For this study, pregnant women living in the study area, who were on the registers of the LHWs, were checked for eligibility. All potentially eligible women identified from the registers were invited by trained data collectors, including the Principal Investigator (PI), to be screened for depression. As this study relied on women registered with the LHWs, pregnant women not registered with the LHWs or an area with no LHWs might have been missed and not included in the study.

4.6 Choice of Study Design

Study design plays an important role in the quality, execution, and interpretation of biomedical and public health research(Rothman et al., 2008, Friis and Sellers, 2013). Each study design has some strengths and weaknesses and there is a hierarchy of study designs which should be considered and should not be applied in a uniform manner (Rothman, 2012, Szklo and Nieto, 2012).

In Epidemiological research studies, three important elements must be considered by the researcher, firstly, the definition and measure of exposure in two or more groups, secondly, measure of health outcome/s in the same groups. Finally, the comparison between groups to explore the relationships between the exposure and outcome (Thiese, 2014).

There are many study designs to choose from within the two broad categories of observational and interventional studies and there is a need to understand their strengths and limitations to arrive at correct study conclusions(Rothman, 2012, Haynes, 2012) .

Observational study designs include cross sectional, case-control, retrospective and prospective cohorts. Often these studies are the only practicable method of studying various problems, for example, studies of etiology, instances where a randomized controlled trial might be unethical, or if the condition to be studied is rare(Rothman et al., 2008). Each study design has specific outcome measures that rely on the type and quality of data utilized. In addition each study design has potential limitations which need to be addressed in the design phase of the study (Checkoway et al., 2004). In this section, we will provide an overview of study designs with their strengths and

weaknesses. Alternative epidemiological designs available to test the hypothesis will be discussed in relation to their suitability to meet the aims and objectives of the study.

Table 6: Strengths and limitations of Observational studies

Study design	Strengths	Weaknesses	Justification
Cohort	Establish incidence of disease Determine causes/effects Most accurate observational study Can study multiple outcomes	Time consuming Most expensive Confounding variables can introduce bias Loss of subject to follow up	Did not use cohort design due to lack of time and resources
Case control	Identify predictors of the outcome Can study rare diseases Less expensive	Possible time order confusion Possible errors in past exposures Can study only one outcome Confounding variables can introduce bias	Did not use case control design as calculation of prevalence could not have been possible
Cross sectional	Determine prevalence of a disease Fast Less expensive Can study multiple outcomes	Possible time order confusion Low in hierarchy of evidence.	Used the cross sectional design as it is a good approach to study prevalence and less researched phenomenon

4.6.1 Cohort Study Design to Measure Association

This is the best method for determining the incidence and natural history of a condition (Mann, 2003). The study may be prospective or retrospective. A group of people is chosen who do not have the outcome of interest. The investigator then measures a variety of variables that might be relevant to the development of the condition. The people in the sample are observed over a period of time to see whether they develop the outcome of interest or not. The retrospective cohort uses data that has already been collected for other purposes. The methodology is the same as that of the prospective study but the cohort is followed up retrospectively(Mann, 2003).

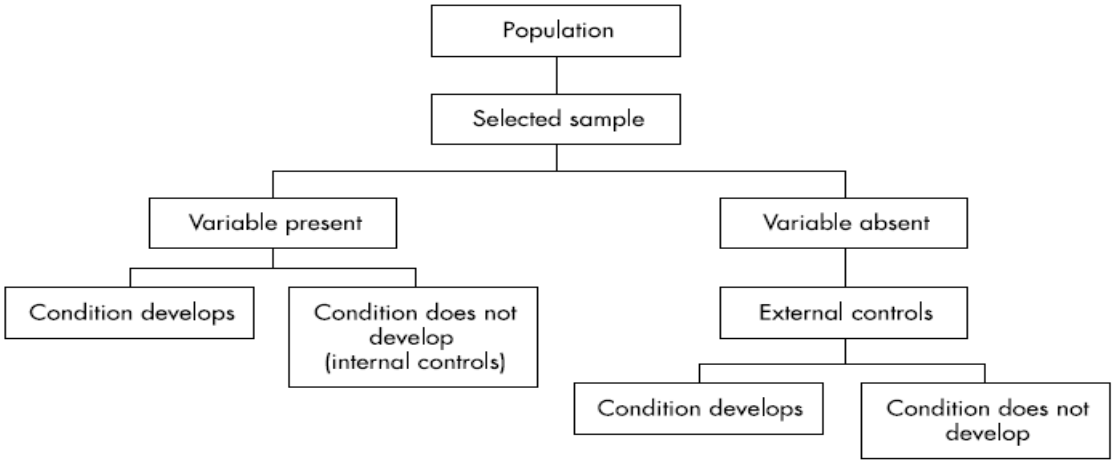

Figure 4: Design of a Cohort study (Creswell and Poth, 2017)

4.6.2 Strengths of Cohort Studies

As a cohort study measures potential causes before the occurrence of the outcome, therefore, it can demonstrate that these "causes" preceded the outcome. A further advantage is that a single study can examine various outcome variables. This contrasts with case-control studies as they assess only one outcome (Thiese, 2014).

It is the only observational study that can calculate both incidence rate and cumulative incidence. Cohort study allows the calculation of the effect of each variable on the probability of developing the outcome of interest i.e. relative risk and relative risk ratio. These studies show temporality and are considered strong measures for causation (Friis and Sellers, 2013, Aschengrau and Seage, 2013).

4.6.3 Weaknesses of Cohort Studies

A prospective cohort study is inefficient when a certain outcome is rare. Another problem with prospective cohort studies is the loss to follow up which can significantly affect the outcome. It is also time consuming, costly and requires large sample size. Retrospective cohorts also have the disadvantage of recall bias as people with the outcome of interest are more likely to remember certain antecedents, or exaggerate or minimize what they now consider to be the risk factors.

4.6.4 Justification for Not Using Cohort Design

The present study aimed to assess the prevalence of prenatal depression, its risk factors and their association with dietary intake of women. The follow up of pregnant women, to find the incidence of the outcome (nutritional status), would not have been

possible/feasible as the student researcher had to follow strict university timelines. However, it was possible to measure the risk for the exposure-outcome relationship in a cross-sectional study design by calculation of odds ratio, prevalence odds ratio, prevalence ratio, and prevalence difference. In general the research drives the design but sometimes the time, resources and feasibility determines the design. Hence, cross sectional study design was deemed to be the most appropriate in this scenario. It helped to first establish a possible link/association between prenatal depression, certain risk factors and dietary intake of women.

As cohort studies measure potential causes before the occurrence of the outcome, such studies can demonstrate that these "causes" preceded the outcome.

4.6.5 Case-Control Study Design to Measure Association

Case control studies are also known as retrospective studies due to the nature of the study design and execution(Altman, 1990, Ahrens and Pigeot, 2005). In this study design, study participants are identified based on their case status, i.e. diseased or not diseased. Quantification of the number of individuals among the cases and the controls who are exposed allow for statistical associations between exposure and outcomes to be established (Rothman et al., 2008, Nelson and Williams, 2013, Ahrens and Pigeot, 2005, Checkoway et al., 2004) . Case-control studies are retrospective and cannot therefore be used to calculate the relative risk. Case-control studies can however be used to calculate odds ratios, which in turn, usually approximate to the relative risk. (Mann, 2003)

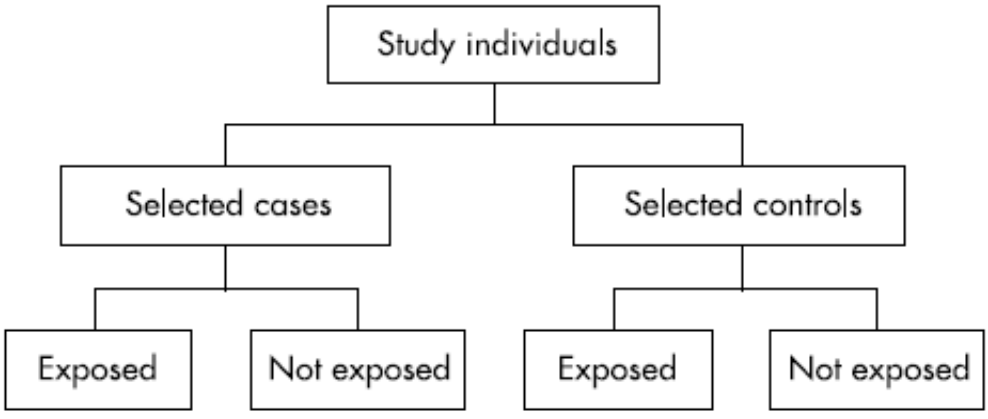

Figure 5: Design of a Case Control Study (Creswell and Poth, 2017)

4.6.6 Strengths of Case-Control Studies

They are suitable for the study of rare diseases because they start with people suffering from the disease. They can successfully be done with moderate numbers of subjects and are therefore smaller, less expensive, and more efficient then cohort studies. Case control studies, being retrospective, can provide information on a wide range of potential etiological exposures that might relate to the specific disease under study and are therefore best suited to study the common exposures. This helps in reliable estimates of exposure odds. (Rothman et al., 2008, Rothman, 2012, Ahrens and Pigeot, 2005, Breslow and Day, 1980)

4.6.7 Weaknesses of Case Control Studies

They can only provide information on the presence or absence of the disease or whatever criteria were selected to choose cases i.e. one illness under study. The major problems with case-control studies are confounding variables and bias. There may be a bias in patient selection (for example, patients referred to a teaching hospital) or control selection (for example, volunteers, different ages, gender or socioeconomic group). As the study assesses exposures retrospectively, there is chance for a biased assessment of their presence and significance by the patient or the investigator, or both. Another weakness is that case control studies are not for studying rare exposures, because the number of subjects who have been exposed will be too small (Mann, 2003).

As it is a retrospective design it is not possible to calculate incidence rates and a direct measure of relative risk cannot be made. However, the odds-ratio can be calculated. The odds-ratio is defined as the ratio of the disease odds in an exposed group to that in an unexposed group (Thiese, 2014).

4.6.8 Justification for Not Using Case Control Design

In the present study, prevalence of depression among pregnant women had to be studied in a population sample. The case control studies are conducted on cases; therefore, it would not have been possible to calculate the prevalence. In a case-control study, any measure of prevalence and associated measures, such as prevalence odds ratio, is artificial because the proportion of cases to non-cases is set arbitrarily by the researcher in this study design.

4.6.9 Cross Sectional Study Design to Measure Association

Cross-sectional studies are also called prevalence studies because one of the main measures which can be assessed in study population is prevalence. In these studies, samples are selected based on their exposure and outcome status is obtained after participants are enrolled in the study (Levin, 2006).

In cross sectional studies the measurements on each person are made at one point in time. Subjects are assessed to determine whether they were exposed to the risk factor and whether they have the outcome of interest(Rothman, 2012, Friis and Sellers, 2013, Aschengrau and Seage, 2013). During the data collection some of the subjects would not be exposed nor do they have the outcome of interest. This makes cross sectional study different from the other observational studies i.e. cohort and case control, where reference to either exposure and/or outcome is made(Mann, 2003).

Cross sectional studies are useful as they allow the researcher to compare many different variables at the same time (Bland, 2015).

4.6.10 Strengths of Cross Sectional Studies

Cross sectional studies are primarily used to determine prevalence. All the measurements on each person are made at one point in time (Levin, 2006). Prevalence is vitally important to the clinicians and public health experts because it influences the likelihood of any particular diagnosis and the predictive value of any investigation as well as helps in planning interventions and directing resources in the right places (Sedgwick, 2014) Another advantage of such studies is that subjects are neither exposed, nor treated and hence there are seldom ethical difficulties. These studies are less time consuming, relatively cheap as only one group is used, data is collected only once and multiple outcomes can be studied.

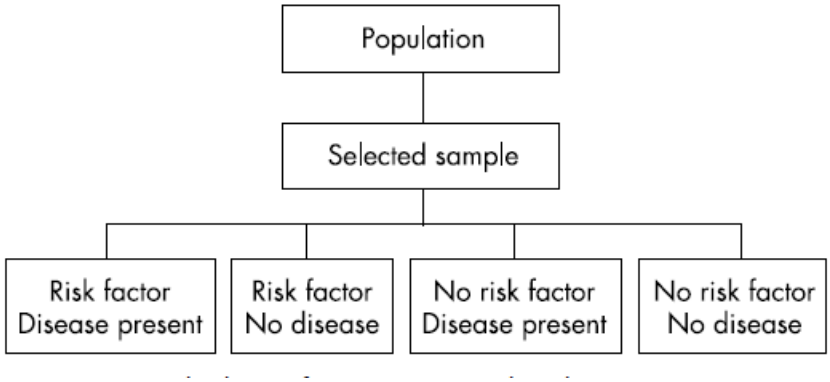

Figure 6: Design of a Cross Sectional Study (Creswell and Poth, 2017)

4.6.11 Weaknesses of Cross Sectional Studies

The most important problem with this type of study is differentiating cause and effect from simple association. Rare conditions cannot be efficiently studied using cross sectional studies because even in large samples there may be no one with the disease. Additionally, natural history of disease cannot be studied as it is not a follow up design. As in cross sectional study exposure and outcome are assessed simultaneously it is not possible to demonstrate that the exposure preceded the outcome (Levin, 2006, Sedgwick, 2014)

4.6.12 Justification for Choosing Cross Sectional Design for the Study

In first part of the study, prevalence of prenatal depression and its associated factors are explored; therefore, cross-sectional design is a good approach to measure prevalence. In the second part of the study, the association between prenatal depression and dietary intake of women is being explored. This study design is well-suited for less researched phenomenon. This design can also be used to infer causation, although it is less reliable as compared to cohort and case control. Cross-sectional studies generate hypotheses about less researched phenomenon which can be tested using cohort or other designs (Mann, 2003). Therefore, in this study the association of prenatal depression with dietary intake and other variables will be explored using the cross-sectional study design.

Data in this design is collected once and multiple outcomes can be studied; thus this type of study is relatively cheaper and consumes less time which suits the researcher as well (Sedgwick, 2014).

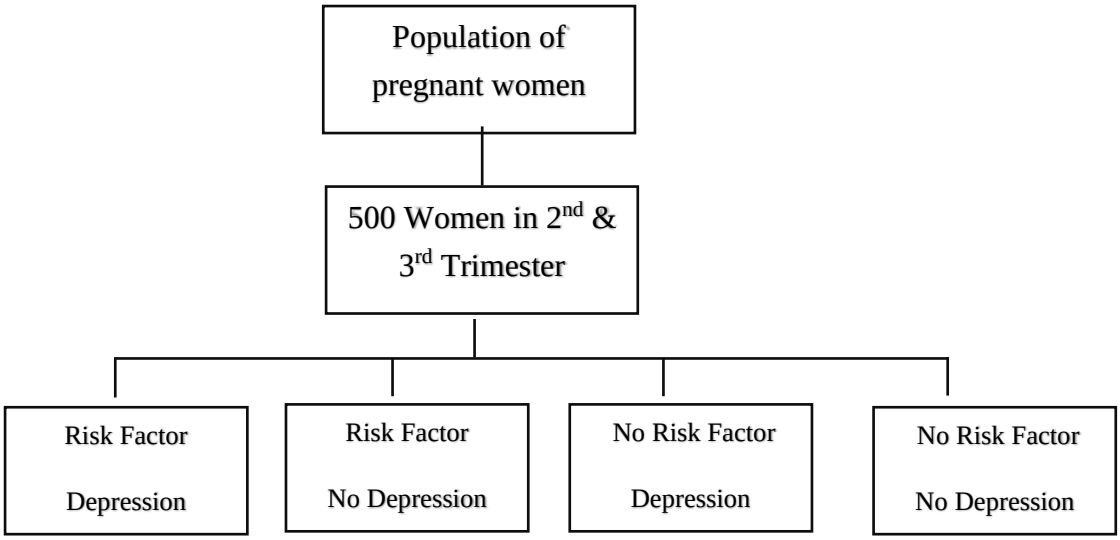

Figure 7: Cross sectional design for the present study

4.7 Data Collection Procedure

In this study, screening and baseline assessments took place at a venue of the participants' choice which was either her own house, the LHWs' setup called a "health house", or at any other household in the community.

All women who consented to take part in the study were approached by a trained female research team, accompanied by LHWs, who introduced the research team to the household members. Following the introduction, the trained research team obtained informed consent from the participants by informing them about the study and encouraged them to ask any questions they might have about the study. After ensuring that participation was voluntary and they can withdraw consent at any point during the interview, or refuse to answer a particular question, all the instruments were administered. During the conduct of the survey one or more female relatives of the participant were frequently present in accordance with cultural norms, although efforts were made to conduct the interviews in a separate room to ensure privacy. The LHW presence in the house was utilized to minimize this involvement and majority of family members were kept busy during the conduct of survey interviews.

It was highlighted that participants had the right to refuse answers to any questions that they do not feel comfortable with and that they can withdraw from study at any point in time. They were also informed that refusal to participate will have no negative effects on the health care received through the LHWs or at any other health

care institution. The participants were told that no personal information will be associated with their data; data will be assigned with a study ID and only this ID will be used for the study assessment, publication or presentation.

4.8 Choice of Instrument to Measure Prenatal Depression

Two approaches are available to identify depressed population: a) Diagnostic interview, conducted by trained and experienced specialists, which would give a clinical diagnosis; and b) Screening instruments, which may be self-administered, or administered by non-specialist workers after brief training. These do not diagnose but demonstrate a "probability" of having the disorder or problem being assessed. Some of the screening questionnaires used for detecting prenatal depression include "Self-reporting Questionnaire" (SRQ), "Edinburgh Postnatal Depression Scale" (EPDS), "Beck Depression Inventory" (BDI), "Hospital Anxiety and Depression Scale (HADS), "Center for Epidemiologic Studies Depression Scale" (CES-D), "Schedules for Clinical Assessment in Neuropsychiatry" (SCAN) and Aga Khan University Anxiety and Depression Scale (AKUADS). Some of these screening tools have been incorporated into routine clinical practice in managed-care organizations.

The SRQ consists of 20 questions with the aim of detecting depression usually in a community setting. It is considered to be reliable and valid (Husain et al., 2006b). EPDS, a 10 item self-report questionnaire, is a widely used screening tool for prenatal depression (Tendais et al., 2014, Kozinszky and Dudas, 2015). It has been used in studies across Pakistan (Shah et al., 2011, Humayun et al., 2013, Husain et al., 2011, Imran and Haider, 2010). The Beck Depression Inventory (BDI) is a 21 item self-report questionnaire commonly used to assess the extent of depression (Storch et al., 2004). The HADS consists of 7 items and assesses both depression and anxiety. It is generally used for hospital based studies in psychiatric and medical patients (Löwe et al., 2003). The CES-D scale is considered to be a valid measure to identify current levels of depression in the general population (Shafer, 2006). The 25-item self-report questionnaire, AKUADS is developed in Urdu (National language of Pakistan), and is used to assess psychological morbidity in patients (Khuwaja et al., 2004, Ali et al., 2009).

It usually takes at least an hour to complete a diagnostic interview and requires specialized skills. By contrast, screening instruments are often quite quick and seldom

require the administrator to have extensive clinical experience. Therefore, they can provide economic means for obtaining information on emotional and behavioral problems in large population surveys. However, it can be subject to things like social desirability bias where people want to seem good (Nease and Malouin, 2003).

Of all the instruments, the PHQ-9 is appealing for several reasons. Firstly, its brevity; at only 9 items, it is substantially shorter than other measures. Secondly, as compared to most other instruments developed to detect depression, the PHQ-9 was developed and validated for use with patients with systemic conditions. This is critical because it was examined for criterion validity in a population with high rates of physical symptoms and psychological distress. The PHQ-9 has demonstrated acceptability among non-psychiatric patients as well as among busy primary care providers. Thirdly, with the same nine items, one can establish provisional depressive disorder as well as grade the severity of depressive symptoms, whereby PHQ-9 scores of 5, 10, 15, and 20 represent cut-offs for lower limits of mild, moderate, moderately severe, and severe depression, respectively (Kroenke and Spitzer, 2002a). Finally, and most importantly, the PHQ-9 consists of actual nine criteria on which the diagnosis of DSM-IV depressive disorder is based.

4.8.1 PHQ 9 to Measure Prenatal Depression in the Study

The approach chosen for this study is to use a screening instrument that measures the probability of having a common mental disorder such as anxiety or depression, and provides a score that gives a measure of psychological distress (Kroenke and Spitzer, 2002a).

The prenatal depression screening instrument, used in this study, is the nine item Patient Health Questionnaire (PHQ-9). Urdu version of PHQ 9 has previously been used in Pakistan in "Thinking Healthy Program" in populations similar to the target population and can provide categorical "probability" of being a case with sufficient confidence (Fraz et al., 2013, Sikander et al., 2015). It has also been used in primary care settings in India to detect common mental disorders (Patel et al., 2008), and in conflict hit populations in Pakistan for screening of depressive disorders (Rahman et al., 2016, Sijbrandij et al., 2015).

All pregnant women, who had PHQ-9 scores of 10 or more, were invited to participate in the SHARE trial; their baseline assessment and informed consent were

taken. Mothers who had PHQ-9 scores of less than 10 were provided with a brief explanation of their results and were selected through simple random sampling. Random numbers were generated in the tablets which were used in data collection in which there was a 50% chance of opening the baseline form for non - depressed pregnant women.

The questionnaire scores each of the 9 "*Diagnostic and Statistical Manual of Mental Disorders fourth edition" (DSM*-IV) criteria on a 4 point Likert scale from being not depressed at all to being depressed nearly every day over the previous 14 days. The score for each question is added to arrive at a total score (Kroenke and Spitzer, 2002a). It has been observed by a study that a cut-off score of 10 can detect moderate depression with a high PPV, "positive predictive value"(Manea et al., 2012). This cut-off score was used for share trial and has been used in the present study as well as PHQ-9 with a cut-off of ≥10 (i.e. moderate depression), has good predictive value (Kroenke and Spitzer, 2002a).

4.8.2 Validity of PHQ 9

The PHQ has been validated using 3,000 primary care patients in 8 different clinics and 3,000 obstetrics/ gynecology patients in 7 different clinics (Spitzer et al., 1999, Spitzer et al., 2000). Translated version of PHQ9 has been used in Pakistan and validated in coronary settings (Gholizadeh et al., 2017). Husain et al, in a community based survey, observed that Urdu version of PHQ having 16 items is equally effective as "Self- Reporting Questionnaire" (SRQ) for screening depression in a given community (Husain et al., 2006b).

Presently, a PHQ 9 validity paper "**criterion related validity and reliability of the Urdu version of the patient health questionnaire in community-based settings of Pakistan"** by Gallis et al, is under review by Peer J, and is awaiting publication.

Table 7: PHQ 9 validity studies in Pakistan

Study	Questionnaire	Specificity	Sensitivity	PPV	NPV
Husain et al., 2006b	PHQ-9	85.2	69.6	78.9	77.8
		95.5	51.1	90.2	70.5
	SRQ	80.8	93.1	77.9	94.1
		91.8	67.0	86.3	78.4
Gholizadeh et al., 2017	PHQ-9 ≥6	78.0	78.0		
Gallis et al (awaiting publication)					

Table 8: PHQ 9 Global validity studies

Study	Questionnaire	Sensitivity	Specificity	PPV	NPV
Flynn et al., 2011	EPDS≥13	0.80	0.74	0.94	0.36
	PHQ-9≥10	0.74	0.73	0.94	0.31
Muñoz-Navarro et al., 2017	PHQ-9≥10	0.95	0.67	0.88	0.83
Sidebottom et al., 2012	PHQ-9≥10	0.85	0.84	0.17	0.99
de Lima Osório et al., 2009	PHQ-9≥10	1.00	0.98	0.97	1.00
Kroenke et al., 2001	PHQ-9≥10	0.88	0.88		
Patel et al., 2008	PHQ 9	0.64	0.90	52	
Gelaye et al., 2013	PHQ-9≥10	0.86	0.68	55	91

Flynn et al., carried out a study on perinatal women, who needed psychiatric help, comparing EPDS with PHQ 9. They observed that, although EPDS is specifically

used for pregnant women, both screening tools are equally effective in detecting prenatal depression (Flynn et al., 2011). In a primary care setting of the Spanish population, PHQ 9 was tested and found to be an effective screening tool for depression (Muñoz-Navarro et al., 2017). In Minnesota, Sidebottom et al validated PHQ 9 in comparison with "structured diagnostic interview" (SCID-IV) among women coming for prenatal checkups at Primary Health Care centers (Sidebottom et al., 2012). In a study carried out in Brazil, PHQ 9, adapted in Brazilian language, was compared with PHQ 2 and validated by using SCID as the standard guideline (de Lima Osório et al., 2009). The study found that a cut-off score of 10 yielded good results in detecting depression.A study in primary care and Gynecological/obstetric populations comparing results obtained by PHQ 9 with those of "Mental Health Professional" interviews (MHP). PHQ 9 was found to be reliable and efficient to detect and measure depression (Kroenke et al., 2001).

Patel et al., compared five depression screening questionnaires (including PHQ 9), in Primary care facilities in India, with the "Clinical Interview Schedules-Revised" (CIS-R) and found all five to be equally effective (Patel et al., 2008). In a study carried out in Ethiopia, PHQ 9 validity was done in comparison with Schedules for Clinical Assessment in Neuropsychiatry (SCAN) and it was found to be effective in diagnosing depression in East African population (Gelaye et al., 2013).

Table 9: Properties of several screening questionnaires for common mental disorder assessed in a sample of primary care attenders in Goa, India (Patel et al., 2008)

Questionnaire	Cut-off score*	Proportion correctly classified (%)	Sensitivity (%)	Specificity (%)	Positive predictive value (%)	Positive likelihood ratio
GHQ	5/6	87	73	90	61.2	7.58
	6/7	87	60	93	64.5	8.73
	7/8	89	52	97	77.1	16.16
K10	5/6	85	65	89	52.5	5.63
	6/7	87	54	93	61.9	8.26
K6	3/4	86	58	91	56	6.47
PHQ-9	11/12	88	64	90	51.8	7.9
SRQ	11/12	88	64	90	51.8	7.86
	12/13	89	55	92	53.3	10.36

GHQ: General Health Questionnaire, K10 and K6: 10- and 6-item Kessler psychological distress scales, PHQ: Patient Health Questionnaire, SRQ: Self-Reporting Questionnaire.
**5/6 represent a cut point between the values 5 and 6 and represent caseness.*

Acceptable cut-off scores for the questionnaires against the ICD-10 diagnosis for any common mental disorder (CMD) criterion (Patel et al., 2008)

The mean scores on each questionnaire and their internal consistency are shown in Table 9. The SRQ, GHQ and K10 showed high internal consistency (Cronbach's $\alpha > 0.8$) while the PHQ and K6 demonstrated moderately high levels of internal consistency (Cronbach's α 0.79 and 0.74 respectively).(Patel et al., 2008)

The study also found the highest correlations were between the SRQ and the GHQ ($\rho = 0.79$), PHQ (0.82) and K10 (0.84). The lowest correlations were between the K6 and the GHQ ($\rho = 0.58$) and the PHQ (0.57).

4.8.3 Tool to Measure Perceived Social Support

This scale was used to assess perceived social support. Multi-dimensional scale of perceived social support (MSPSS) was developed by Zimet and colleagues (Zimet et al., 1990).

It is a self-rating tool of perceived social support consisting of 12 questions which are rated on a 7-point scale. The questions are grouped into 3 categories and ask about support received from *Significant Other, Family and Friends*. The 7-point scale ranges from 1 "very strongly disagree" to 7 "very strongly agree". This tool has been

translated to Urdu and extensively used in the Pakistani population and has been found to have good construct validity and internal consistency (Akhtar et al., 2010). MSPSS was preferred over other measures of perceived social support as it has been validated and used in similar research in other parts of the country (Husain et al., 2006a, Husain et al., 2012, Akhtar et al., 2010, Rahman et al., 2008). Similarly, MSPSS has been adapted and validated in Turkey and has shown significant power in the assessment of social support across different strata of population (Eker D and Yaldiz, 2000).

The instrument's questions along with the analysis criteria are presented in the table below.

Table 10: Social support Variables

Category/variable	Description and criteria
• "There is a special person who is around when I am in need" • "There is a special person with whom I can share my joys and sorrows" • "I have a special person who is a real source of comfort to me" • "There is a special person in my life who cares about my feelings" • **Score on *Significant Other* subscale**	• These variables are scored from 1 to 7 where 1 is "very strongly disagree" and 7 is "very strongly agree". • Higher scores indicate better perceived levels of social support. These four variables reflect support from "*Significant Other"*. • *Significant Other* subscale score is derived by calculating the total score of the above four variables and is presented as interval/continuous data in the analysis.
• "My family really tries to help me" • **Score on *Family* subscale** • "I get the emotional help and support I need from my family" • "I can talk about my problems with my family" • "My family is willing to help me make decisions"	• These variables are scored from 1 to 7 where 1 is "very strongly disagree" and 7 is "very strongly agree". • Higher scores indicate better perceived levels of social support. These four variables reflect support from *"Family".* • *Family* subscale score is derived by calculating the total score of the four variables is presented as interval/continuous data in the analysis.
• "My friends really try to help me" • **Score on *Friends* subscale** • "I can talk about my problems with my friends" • "I can count on my friend when things go wrong" • "I have friends with whom I can share my joys and sorrows"	• These variables are scored from 1 to 7 where 1 is "very strongly disagree" and 7 is "very strongly agree". • Higher scores indicate better perceived levels of social support. These last four variables are reflecting support from *"Friends".* • *Friend's* subscale score is derived by calculating the total score of the four variables and is presented as interval/continuous data in the analysis.

4.8.4 Tool to Measure Stressful Events in the Previous Year

Stressful life events in the previous year have been demonstrated as associated with the development of depressive symptoms during pregnancy. In Pakistan, Rahman and his associates (Rahman et al., 2003a) used Husain's (Husain et al., 2000) data and developed a checklist from variables that were commonly associated with depression in that study. This checklist was based on Life Events and Difficulties Schedule (LEDS) (Brown and Harris, (1989). The use of stressful life events checklist (LEC) had

been validated by some other studies as well (Gray et al., 2004, Bae et al., 2008, Elhai et al., 2005). These life events are summarized in the table below.

Table 11: Stressful life events checklist in the last year (LEC)

Variable	Description and criteria
Illness, accident or hospitalization	"You or a close relative had been ill or had an accident which led to hospitalization".
Death, suicide or serious illness	"Any of your close relatives died or committed suicide or had become seriously ill".
Livelihood problems	"Has anyone in your family had problems of livelihood? For example unemployment, losing a job or starting new work/job".
Financial problems	"You or someone in your family has had any financial problem (e.g. having debts)".
Change in social status	"You or someone in your family has had a change in social status (e.g. engagement or marriage, separation or divorce, starting or finishing education)".
Problem with residence	"You yourself have had any problem with your residence (e.g. change of residence or problems with neighbors)".
Troubled relations with Relatives	"Your relations with any of your close relatives or friends have been troubled (e.g. quarrels or falling out etc.)"
Troubled marital relations	"Your marital relations with your spouse have had problems. (e.g. Quarrels or rows etc.)"
Worried about children's Problems	"You have been worried about your children's problems " (e.g. Problems concerning Children's health and education etc.)"
Quarrels in the family	"You or other family members have had rows/quarrels amongst themselves".
Categories of LEC:	
Stressful events in past year	1-2
Stressful Events in past year	3-4
Stressful Events in past year	5^{+}

4.8.5 Tool to measure women autonomy/decision making

Separate indices were developed to assess women's autonomy, based on a number of household decisions in which women participate, for example, control over own earnings and her husband's earning (PDHS 2012-13). Questions were based on whether decisions are made by her, by her husband, by both, by her and other family

members or only other family members (e.g. mother in law, father in law). Scores were calculated for full autonomy (herself only =2), partial autonomy (herself and husband or herself and other family members=1) and no autonomy (Husband only and others only=0)

4.8.6 Tool to Measure Intimate Partner Violence (IPV)

Tool to assess IPV was based on WHO Multi Country Study On Women's Health And Domestic Violence Against Women (Ellsberg et al., 2008a). Physical and sexual violence were measured by asking direct questions about the respondent's experience of specific acts.

For physical violence, women were asked whether a current or former partner had ever:

- "Slapped her, or thrown something at her that could hurt her"
- "Pushed or shoved her"
- "Hit her with a fist or something else that could hurt"
- "Kicked, dragged or beaten her up; • choked or burnt her on purpose"
- "Threatened her with, or actually used a gun, knife or other weapon against her"

If yes to any question of physical violence = ever experienced physical violence.

Whether it happened in last 12 months and if yes what was the frequency?

- 1-3 times
- 4-6 times
- 6-9 times or more.

Sexual violence was defined by the following three behaviors:

- "Being physically forced to have sexual intercourse against her will"
- "Having sexual intercourse because she was afraid of what her partner might do"
- "Being forced to do something sexual she found degrading or humiliating"

If yes to any question of sexual violence = ever experienced sexual violence.

Whether it happened in last 12 months and if yes what was the frequency?

- 1-3 times
- 4-6 times
- 6-9 times or more

Psychological violence was defined by the following:

- "Insulted or made her feel bad about herself"
- "Did things to scare or intimidate her on purpose"
- "Intimidate to hurt her or someone she cared about"

If yes to any question of psychological violence = ever experienced psychological/emotional violence

Whether it happened in last 12 months and if yes what was the frequency?

- 1-3 times
- 4-6 times
- 6-9 times or more

4.8.7 Measurement of Socio-economic and Demographic Variables

Variables pertaining to potential determinants of psychological distress during pregnancy were identified from a review of previous studies conducted in Pakistan (Rahman et al 2003; Husain et al 2007). Socio-economic and demographic variables

are grouped as follows These are described below:

- Maternal Factors
- Family Factors
- Socio Economic Factors

4.8.8 Maternal Factors/Variables

Age

Age (in years) was taken as interval data and was later categorized into 3 categories 15 -22 years 23- 30 years and 31+

Education

Data on maternal education was collected using the question "How many formal years of schooling did you have?" The respondents had to recall the number of years of schooling they had completed and the highest level of education attained. This was normally responded to as the number of grades a person has passed and roughly equals the number of years of education. Educational level was later categorized to no education, having a primary or middle degree, secondary or higher secondary, bachelors and above.

Number of Pregnancies and Duration of Current Pregnancy

Mothers were asked about the number of times they got pregnant including the current pregnancy irrespective of the outcome. It was later categorised as <3 ,3-6 and 6+.

The duration of a pregnancy was reported by the participant in months. For comparison of results in different trimesters and association with psychological distress, duration of pregnancy was subsequently categorized to 2nd and 3rd trimester as 4-6 months and >6 months respectively. The selection was based on women in second and third trimester of pregnancy.

History of Miscarriage, Stillbirth, Infant death and Child death

As rates of still birth, miscarriages, and infant and under 5children deaths are high in Pakistan (NIPS, 2008) these variables were explored in the survey as a series of questions. The first question was "have any of your children died from any cause?" The answers were continuous numbers as zero for no and 1, 2 and so on for yes answers. In the later questions these were categorized according to the age of death from ≥1 year, <1 year and during pregnancy as beyond infancy, infancy and pregnancy losses (miscarriage or still birth) respectively. Later, during analysis, these individual variables were coded as yes or no whether the respondent had a history of pregnancy loss or infant death to see the association with the current prenatal depression.

Pre-Pregnancy BMI

BMI is the weight in Kilograms (kgs) / height in meters^2. The participants' weight and height were measured at the place of interview using standardized equipment and procedures. Most participants did not have scales at home, and could

not provide self-reported pre-pregnancy weight. Thus, pregnancy weight gained before this interview was estimated using Institute of Medicine (IOM) weight gain recommendations for a normal-weight woman per week and trimester of pregnancy (0·15 kg/week in trimester 1 and 0·42 kg/week in trimesters 2–3) (Council, 2010) and subtracted from the participants' measured weight on the interview day.

No. of Living Children and Contraceptive Plan

The number of living children was asked as a continuous variable and later categorized as 1-3 and 4+. Intentions of the mothers about contraception were also recorded as a dichotomous response.

Place of Delivery

Mothers were also asked about the place where they delivered their last child, whether in hospital or any other place.

4.8.9 Family Factors

Husband's education

This variable was coded the same way as maternal education.

Family Structure

Family structure was explored during the survey and respondents were asked whether they are living in a joint family system (with the family, in-laws and parents living together in one household) or nuclear (where only the married couple lives with their children) or multiple families are living in one house and have separate kitchens (uncles, cousins etc.)

The grandmother's presence in the family was also found from the family structure.

Living children

A series of continuous questions were asked about the total number of children in the family, female children, male children and children less than 7 years old. From these continuous variables a dichotomous variable was generated as more than 2 children younger than 7 years of age in the family (yes or no). This was used to determine the presence of 2 or more children of young age and whether this had

any association with psychological distress during pregnancy. In addition, presence of two or more female children in the family was also recorded.

Husband Living Away

This was to explore whether the husband living away from home has any effect on depression during pregnancy. The mothers were asked if their husband was living away from home for work or employment for 6 or more months each year. A husband's living away for 6 or more months per year was coded as "yes" and the other category as "no".

Perception of Life Satisfaction Now and in Next 4 years

To explore how satisfied the mothers are with their life at present and will be in next five years, a five-point scale from "very satisfied" to "very dissatisfied" was developed. Later for analysis purposes categories were merged to get 3 categories as satisfied, moderately satisfied and dissatisfied.

Suitable Accommodation, Sanitation and Household Crowding

This was done in order to find out if mothers think that the accommodation and sanitation is suitable and the house is not crowded for the family. The relationship of these factors with prenatal depression was explored. Household crowding index was calculated by dividing the number of persons living in house excluding infants by the total number of rooms excluding kitchen and bathrooms.

4.8.10 Socio-economic Factors

Employment Occupation and Income

Both women and their husband's employment statuses were confirmed and their occupation was dichotomized as either manual worker (e.g. factory worker, farmer, laborer, driver, shopkeeper, cook, cleaner or non-manual worker (e.g. teacher, clerk, banker, government official etc.) and any other occupation.

Women's, Husband's and Family Income

Questions regarding income were along a continuous scale but categorized for analysis purposes in Pakistani rupees (PKR) < 12,000, 12,000- 21,000, 22- 30,000 and > 31,000 as the minimum pay according to Government of Pakistan pay policy for 2014 was PKR12000 (www.paycheck.pk › Home › Salary › Minimum Wage).

Wealth Index

Based on the questions related to assets owned by the household, quality of housing, water and sanitation, source of energy and fuel for cooking, the wealth index was calculated. Indicator weights were allocated by using "principal components analysis" (PCA). It is a process used for the DHS wealth index. Demographic Health Survey uses the SPSS factor analysis procedure. This procedure first standardizes the indicator variables (calculating z- scores); then the factor coefficient scores (factor loadings) are calculated; and finally, for each household, the indicator values are multiplied by the loadings and summed to produce the household's index value. In this process, only the first of the factors produced is used to represent the wealth index. The resulting sum is itself a standardized score with a mean of zero and a standard deviation of one. And the final score divided into five equal parts to make wealth quintile. This results in:

$$\text{Wealth Index/Quintlies} = \begin{cases} 1, & Poorest \\ 2, & Poor \\ 3, & Average \\ 4, & Rich \\ 5, & Richest \end{cases}$$

The presence of some control over household finances was chosen as a measure of empowerment and status within the household. The tool was used in the study by(Rahman et al., 2003a) in the same area. Financial autonomy was measured by asking women if they received any money by the husband or head of household for everyday use, and whether they used this money as she wished. If both answers were yes, women were financially empowered.

Money for daily needs, food, expenditure for food, health and education in the last month and family debt was recorded to assess the socioeconomic conditions of the family. It was asked if the family had money for daily needs and to buy food and what the expenditure in the previous month on food, health and education was and whether the family was in debt.

4.9 Sample Size Estimation

Probability sampling using random sampling is the method of choice for this study. For the main trial 40 clusters had already been identified. The sample size calculation was based on the prevalence estimate of prenatal depression in pregnant

women, and association of depression with exposure to life events and other factors. Based on a previous study in rural Rawalpindi in Pakistan ((Rahman et al., 2003a), a prevalence rate of prenatal depression was assumed to be 25% and with an alpha of 0.05 and a precision of 0.01 ,a sample size of 497 pregnant women would allow us to estimate the prevalence, using the following formula

$n=z^2 p (1-p)/d^2$

Where z is the z statistic of confidence level, p is prevalence; d is the precision (Dean AG, 2011). Assuming a non-response rate of 10% for refusals and exclusions combined, the final sample size for the survey was 546.

4.9.1 Data Cleaning, Coding and Missing Data

All the data collected were cleaned, computerized and filed by the student herself. The data were cleaned using the process described in (Van den Broeck et al., 2005). The data was cleaned for errors using graphical methods, by checking ranges and frequency distribution, cross-tabulations and summary statistics. Data was randomly checked against the original format at the end of data entry. Data errors were diagnosed and corrected after checking with the data collection. This is how complete data was collected on all the variables included in the study.

The data were coded, entered and analyzed using the SPSS 20 statistical package. The main outcome, prenatal depression , was dichotomized on the basis of a cut off of score of $\geq$10 (Kroenke and Spitzer, 2002b) and a prevalence of prenatal depression was calculated. The outcome variable was dichotomized and not used as continuous variable to enable comparison with other relevant national and international research (Kroenke et al., 2001) mention studies as well as estimation of the prevalence. Such prevalence figures, and the statistics generated, are easier to understand by policy-makers and practitioners, and also provide evidence if an intervention is needed. For other variables, categorization of continuous variables was avoided to preserve statistical efficiency, although some variables were categorized to ease understanding and variable categories were informed by clinical or social knowledge rather than on the basis of statistical ease.

By far the most common approach to the missing data is to simply omit those cases with the missing data and analyze the remaining data. This approach is known as the complete case (or available case) analysis or list-wise deletion. List-wise deletion

is the most frequently used method in handling missing data, a list wise deletion is known to produce unbiased estimates and conservative results (Kang, 2013). As we have a large enough sample, where power is not an issue this method is most suitable.

4.10 Statistical Analysis

Descriptive Analysis

Socio-demographic, maternal and husband's characteristics were elaborated as frequencies (percentages) and mean (S.D) where appropriate. Similarly, individual items of PHQ 9, perceived social support, life events, autonomy, MSSI, Substance abuse, history of mental illness in family, HCI and IPV were analyzed and frequencies (percentages) obtained.

Univariate Analysis

The subjects identified with prenatal depressive symptoms (PHQ9score $\geq$10) were compared with those without depressive symptoms across various socio-demographic, maternal and husband's characteristics, MSPSS, empowerment, life events, autonomy, MSSI, Substance abuse, Mental illness in family, HCI and IPV variables using the chi square test, in case of categorical data (Fisher's two-sided exact test was used if numbers in the cells were less than 5). In order to compare scores of the indices mentioned above two sample t-test was used.

Multivariate Analysis

Ordinary linear regression predicts the expected value of the outcome variable as a linear combination of a set of predictor factors. The data type of outcome in ordinary least square is continuous. Several models exist depending on the data type of outcome variable. These models are under the title "Generalized Linear Model" (Hastie and Tibshirani, 1990) which can model the

- Continuous outcome through linear link function, known as multiple linear regression.
- Categorical outcome through logit link function, known as multiple logistic regression.
- Count outcome through log link function, known as multiple poison regression.

Analysis of data where primary endpoint is a binary variable can be analyzed using a generalized linear model (Madsen and Thyregod, 2010) with logit link function.

As in our study primary endpoint is a binary variable (prenatal depression) it was analyzed using Generalized Linear Model with logit link function. The odds ratio between the two groups with and without depression along with 95% confidence interval were derived from the model. Factors such as, maternal, family, economic characteristics, as well as MSPSS, empowerment, life events, autonomy, MSSI, Substance abuse, Mental illness in family, HCI and IPV were considered in the GLM model. The collinear factors were removed from the model. Since model may include some statistically insignificant factors which were supposed to be eliminated from model, so a backward stepwise GLM model selection was carried out. This is an iterative procedure where at each step we removed the in significant factors by using a p value threshold of 0.2 and if a removed factor appeared significant in next iteration it was included. This model building process continued until we were ensured that the model contains the significant factors and is good fitted based on likelihood ratios. In model fitting the multi-collinearity of factors was tested through variance inflation factor (VIF) (Farrar and Glauber, 1967, Wichers, 1975).

4.11 Ethical Consideration

Ethical approval was obtained from the University of Liverpool ethics committee alongside the local "Institutional Review board of Human Development Research Foundation" (HDRF), Islamabad, Pakistan.

A trained research team obtained an informed written consent at screening and baseline. Pregnant women in second and third trimester, whose PHQ-9 scores were lower than 10, were provided a brief explanation of the results and only their base assessment was done. Mothers whose PHQ-9 scores were 10 or more were invited to participate in the trial after baseline assessment and informed consent was taken. Village cluster level consent had already been sought by engaging with the district health system and getting the permission letter to work within the communities alongside the LHWs.

All study participants received an information sheet describing the study with details of its purpose and procedures. Along with informed consent, the trained data collectors also addressed potential risks and benefits of the study. Risks were minimal

but talking about feelings or sensitive topics might have caused emotional upset in some participating mothers. The participants were informed that the researchers were trained in dealing with these situations and that they will receive help if required.

Cases were referred where a participant had active suicidal intent and item 9 of PHQ was marked as 3. In case of the questions regarding IPV if a participant suffered any sort of IPV (psychological, physical or sexual) they were referred to the Institute of Psychiatry, Rawalpindi which has a social services provision for such patients.

This study has been conducted at the baseline so the specific Serious Adverse Events (SAEs) and Other Adverse Events (OAEs) are not defined for this study separately. These have been described for the SHARE trial and remain the same for this study (Sikander et al., 2015)

Study participants had the opportunity to carefully review the written consent form and ask questions regarding the study prior to signing the informed consent. The consent forms were signed by the participant and the researcher who took consent. In case of illiterate participants, the researcher read out aloud from the information sheet. Consent was witnessed and counter-signed by an independent third party (i.e. a family member such as the mother-in-law). The original informed consent form was submitted to the data manager for scanning and electronic storage while the participant received a copy of the form.

CHAPTER 5

RESULTS

5.1 Description of the Sample

Five hundred pregnant women in the second and third trimester of pregnancy were recruited from 1st November 2014 till 29th May 2015 for SHARE a cluster randomized control trial. After screening for depression baseline assessment was done. This study was conducted at the baseline of the trial.

5.1.1 Recruitment of the Sample

A total of 973 women were approached in the above mentioned time for screening for depression. Eighty-two women did not meet the eligibility criteria, out of these 54 were not in the second or third trimester of pregnancy, 19 were less than 18 year of age, 08 did not intend to live in the area and one did not speak Urdu, Punjabi or Potohari. Out of 891 eligible women there were 19 (2.13%) refusals hence the response rate was 97.87%, 332 (37.3%) non-depressed women were screened out due to the process of random sampling (Fig 9).

Women who were found depressed on screening (PHQ score 10 or above) were recruited in the sample. Those who were not depressed were recruited through random sampling. Random numbers were generated by and chance of opening the baseline electronic form on the tablet which was used to collect data was 50% for non-depressed women.

The estimated sample size of the study (described in sample size estimation in methods section) was 546. From the 546 records we discarded 46 due to missing data and finally analyzed data of 500 pregnant women. There were 258 (51.6%) non depressed and 242 (48.4%) depressed women in the sample. The prevalence of depression in the population of pregnant women in second and third trimester in the study area was estimated at 27%.

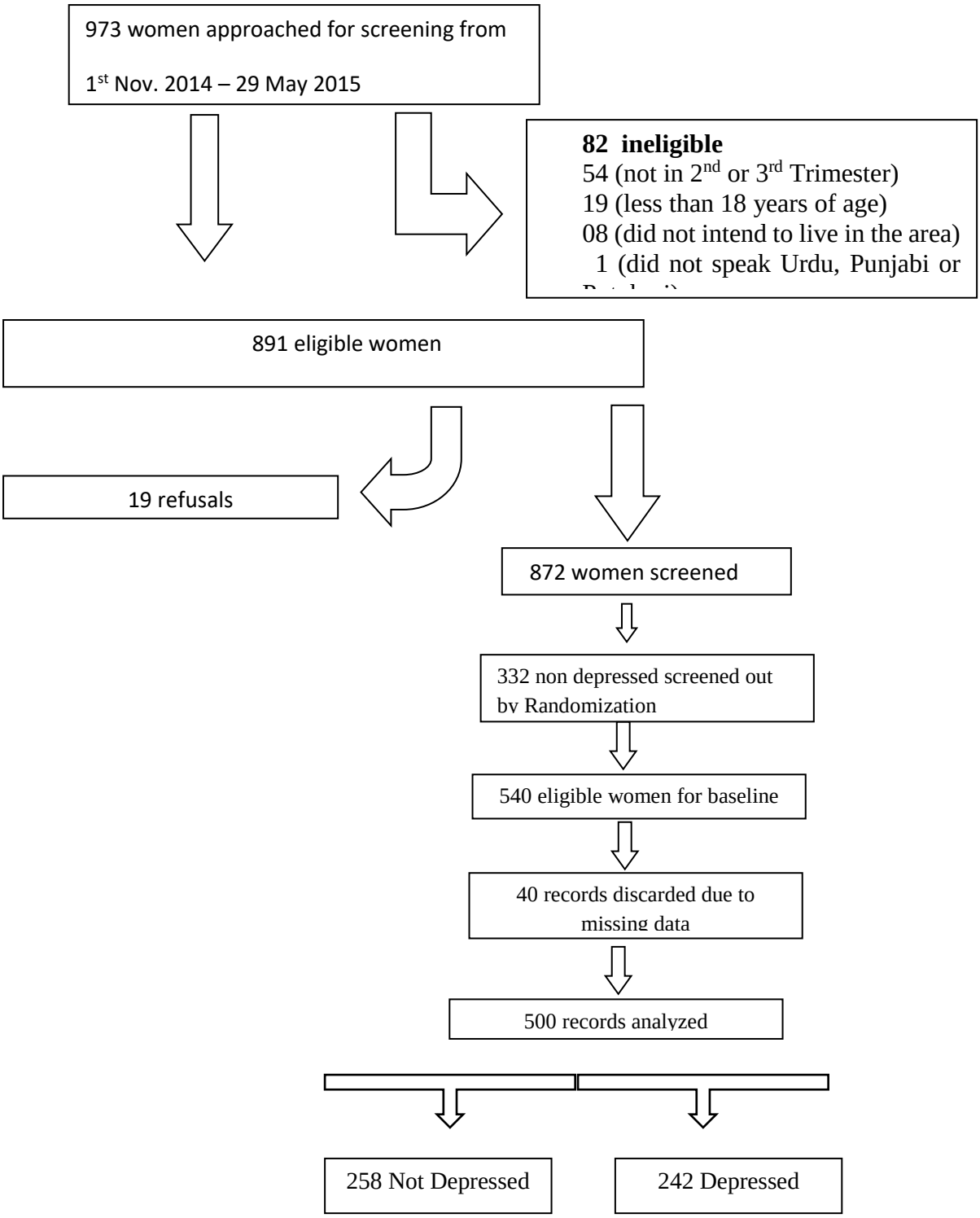

Figure 8: Flow diagram of study sample recruitment

5.1.2 Prevalence of Prenatal Depression

Prenatal depression was measured through PHQ9 which contains 9 questions relating to the self-report of depression symptoms suffered in the last two weeks. A

score of ≥ 10 was used to define prenatal depression. Based on this definition the prevalence of prenatal depression was 27%.

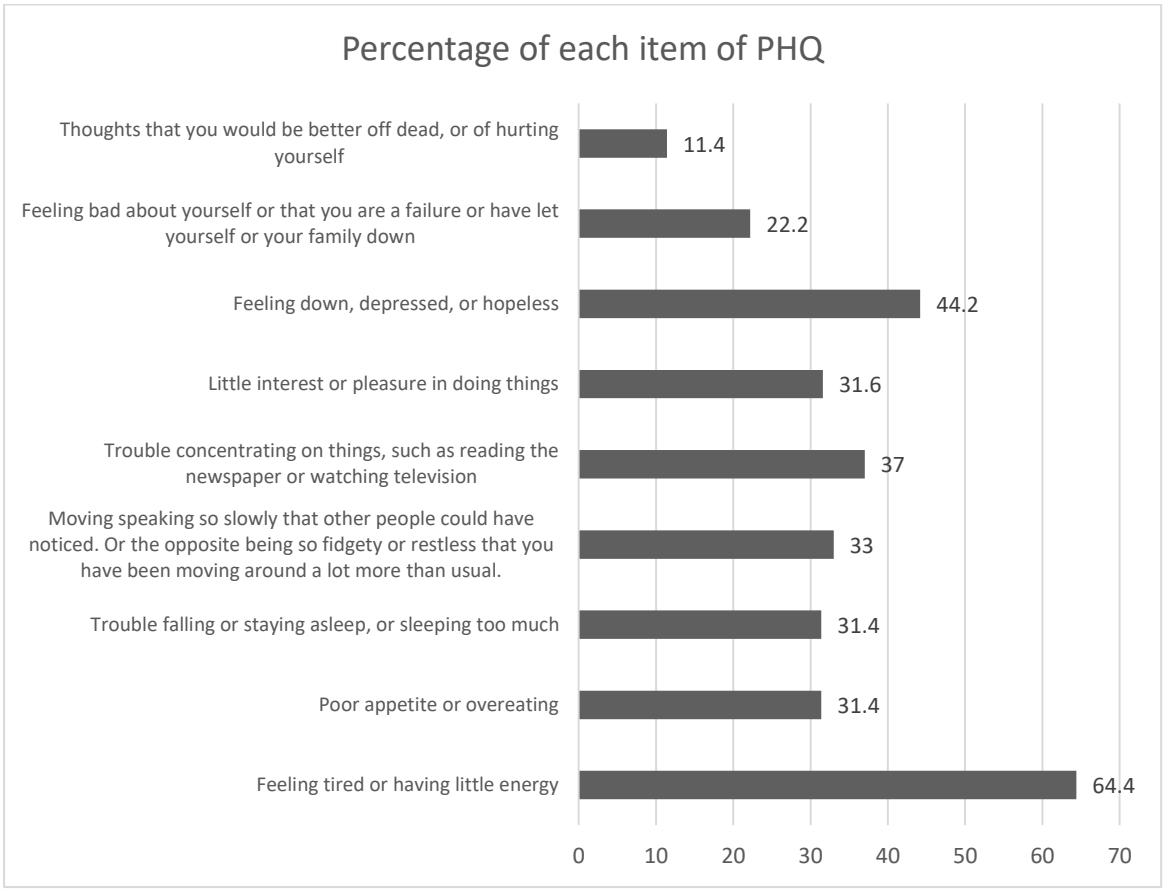

Figure 9: Percentage of Each Item of PHQ 9

5.2 Characteristics of the Study Population

Key background characteristics of the sample are described under headings of maternal characteristics, family characteristics, socioeconomic characteristics and association of all above characteristics with prenatal depression. Table 12-17 show each of these categories separately.

5.2.1 Maternal Characteristics of the Sample

Table 12 describes the maternal characteristics. Almost two thirds (63.4%) of our study participants were 23-30 years of age and 39.0 % had at least primary education. Half of the participants (51.2%) had normal pre-pregnancy BMI, while 23.6% of them were under weight. Mothers who had experienced infant death and child death were 12.2% and 14% respectively. Most of the participants (59.8%) had one or more than one living children and 28.2% had at least one miscarriage.

The present study is based on the interview of gravid women in either second (61%) or third trimester (39%) of pregnancy. The percentage of respondents who thought that they were in a moderate condition of health ~~in~~ for the last 30 days was 39.4%. 31.8 % thought themselves in good health.

According to our results, 65% had less than 3 pregnancies and more than half of the women (55.8%) delivered their last child in hospital and had a plan to use contraceptives in future.

Table 12: Maternal characteristics of the sample

Maternal Characteristic				
Maternal /Obstetrics Factors	**Categories**	**N**	**%**	**Mean (SD)**
Age category	15-22	91	18.2	26.9(4.80)
	23-30	317	63.4	
	31+	92	18.4	
women's education	Uneducated	86	17.2	
	Primary/Middle	195	9.0	
	Sec/h secondary	161	32.2	
	Bachelors & above	58	11.6	
BMI (Pre-Pregnancy Calculate)	Under weight	118	23.6	25.6(11.5)
	Normal weight	256	51.2	
	Overweight	100	20.0	
	Obese	26	5.2	
Infant Death (under one year Death)	No	439	87.8	
	Yes	61	12.2	
Child mortality (1-5 year Child Death)	No	432	86.4	
	Yes	68	13.6	
Misc - Miscarriage	No	359	71.8	
	Yes	141	28.2	
No of living children	0	150	30.0	
	1-3	299	59.8	
	4+	51	10.2	
Duration of pregnancy	2^{nd} trimester (4-6 m)	305	61.0	
	3^{rd} trimester (7-9 m)	195	39.0	
Health in last 30 days	Good	159	31.8	
	Moderate	197	39.4	
	Bad	144	28.80	
Delivery place	Hospital	279	55.8	
	Home	72	14.4	
	other	149	29.8	
Contraceptive plan	No	221	44.2	
	Yes	279	55.8	
No of pregnancies	< 3	325	65.0	
	4-6	144	28.8	
	> 6	31	6.2	

5.2.2 Association of Maternal Characteristics with Prenatal Depression

Table 13 presents the association of various maternal characteristics with prenatal depression measured by the "Patient Health Questionnaire, (PHQ-9)". Women in the age group of 31 + were more depressed (58.7%) as compared to the younger age categories (around 46%) but the association was not significant.

Mother's education was significantly associated with depression. More educated mothers were least depressed and uneducated mothers were most depressed (61.6%). Health status in the last 30 days had significant association ($P<0.001$) with prenatal depression. It was noticed that depression was more among those mothers who had bad health conditions (93.0%) in the last 30 days. The mothers who had their last deliveries at a place other than hospitals or home (58.3%) were depressed more than others and this association was found significant ($P<0.05$).

Pre-pregnancy BMI was calculated and categorized into four groupings according to WHO criteria for BMI. Categories of BMI were labelled underweight (if BMI range from 16 to 18.49), normal (if BMI range from 18.5 to 24.99), over weight (if BMI range from 25 to 29.99) and obese (if BMI $\geq$ 30). It was observed that depression was most prevalent among obese (53.8%) and least prevalent among underweight categories (44.9%) but the association was not significant.

Infant death, child death, miscarriages and duration of pregnancy had no significant association with depression.

Table 13: Association of maternal characteristics with prenatal depression

Maternal /Obstetrics characteristics	Categories	Depression				p-value
		No		Yes		
Mean age			26.5 SD 4.34		27.36 SD 5.2	0.04
Mean BMI			26.11 SD 15.33		25.16 SD 8.94	0.403
		N	**%**	**N**	**%**	
Age category	15-22	49	53.8	42	46.2	0.091
	23-30	17	53.9	14	46.1	
	31+	38	41.3	54	58.7	
women's education						
Uneducated		33	38.4	53	61.6	<0.001***
Primary/Middle		87	44.6	10	55.4	
Sec/H. secondary		99	61.5	62	38.5	
Bachelors		39	67.2	19	32.2	
BMI (Pre-Pregnancy)						
Under weight		65	55.1	53	44.9	0.810
Normal weight		13	50.8	12	49.2	
Overweight		51	51.0	49	49.0	
Obese		12	46.2	14	53.8	
Infant Death (under one year Death)	No	23	52.6	20	47.4	0.221
	Yes	27	44.3	34	55.7	
Child mortality (1-5 year Child Death)	No	22	52.3	20	47.27	0.420
	Yes	32	47.1	36	52.9	
Misc - Miscarriage	No	19	54.3	16	45.7	0.052
	Yes	63	44.7	78	55.3	
No of living children	1-3	94	62.7	56	37.3	<0.001***
	4+	14	49.5	15	50.5	
Duration of pregnancy	2nd trimester	16	31.4	35	68.6	0.631
	3rd trimester	16	52.5	14	47.5	
Health in last 30 days	Good	14	90.5	15	9.43	<0.001***
	Moderate	10	51.2	96	48.7	
	Bad	10	6.94	13	93.0	
Delivery place	Hospital	2	4.9	39	95.1	<0.05*
	Home	13	48.4	14	51.6	
	other	13	41.7	42	58.3	
Contraceptive plan	No	93	62.4	56	37.6	0.151
	Yes	12	55.2	99	44.8	
No of pregnancies	< 3	13	48.7	14	51.3	<0.001***
	4-6	19	58.5	13	41.5	
	> 6	59	41.0	85	59.0	

5.2.3 Family characteristics of the sample

Table 14 shows that most of the respondent's husbands (60.8%) were non-manual workers & almost half of them (49.6%) had secondary or higher secondary education. Around two third (63.4%) of study population lived in joint family system. More than half of the respondents (57.8%) were satisfied with their lives at present and 68% said they would be satisfied for next four years. According to HCI (crowding index) 80.6% of the study population was living in a non-crowded accommodation. More than two third (80%) had suitable accommodation with adequate sanitation.

Table 14: Family characteristics of the sample

Family Characteristics			
Family Characteristics	**Categories**	**Number**	**Percentages**
Husband employment	Manual worker	196	39.2
	Non manual worker	304	60.8
Husband education	Uneducated	31	6.2
	Primary or middle	194	38.8
	Sec/H Secondary	248	49.6
	Bachelors & Above	27	5.4
Family structure	Nuclear	111	22.2
	Joint	317	63.4
	Multiple	72	14.4
Husband away from home in last 6	No	407	81.4
	Yes	94	18.6
Life satisfaction	Satisfied	289	57.8
	Moderately satisfied	136	27.2
	Not satisfied	75	15.0
Life satisfaction in next four years	Satisfied	340	68.0
	Moderately satisfied	112	22.4
	Not satisfied	48	9.6
Grand mother lives in house	No	58	36.3
	Yes	102	63.8
Two or more under 7 children in house	No	419	83.8
	Yes	81	16.2
Two or more girl child in the family	No	409	81.8
	Yes	91	18.2
Suitable accommodation	No	100	20.0
	Yes	400	80.0
Adequate sanitation	No	99	19.8
	Yes	402	80.2
HCI (crowding index)	Not crowded	403	80.6
	Crowded	97	19.4
Rooms in the house	Mean	1.73	
People living in the house	Mean	4.23	

5.2.4 Association of Family Characteristics with Prenatal Depression

Association of family factors with depression is summarized in table 15. Family characteristics significantly associated with depression were husband's education (P<0.001), husband's employment (P<0.001), life satisfaction during time of study (P<0.001) and life satisfaction in the next four years (P<0.001). Women whose husbands were uneducated and manual workers were mostly depressed (65%). Those women who were not satisfied with their life currently and perceived the same in the next four years were more depressed than others.

Mostly the depressed women (68%) thought that they did not have suitable accommodation and adequate sanitation facilities (both P<0.001).

Family structure and a husband away from home did not show any significant association with depression. Most of the non-depressed women were living in a joint family system and their husbands were away for the last 6 months.

Most of the non-depressed women were living in the household having two or more children less than 7 years of age, not having two or more girls or the children's grandmothers at home but the association was not significant.

Table 15: Association of family characteristics with depression

Family factors	Categories	Depression				p-value
		No		Yes		
		N	%	N	%	
Husband Employment						
Manual worker		69	35.2	127	64.8	<0.001***
Non manual worker		189	62.2	115	37.8	
Husband education						
Uneducated		11	35.5	20	64.5	<0.001***
Primary or middle		81	41.8	113	58.2	
Sec/H Secondary		147	59.3	101	40.7	
Bachelors & Above		19	70.4	8	29.6	
Family structure						
Nuclear		56	50.5	55	49.5	0.087
Joint		173	54.6	144	45.4	
Multiple		29	40.3	43	59.7	
Husband away from home in last 6	No	206	50.6	201	49.4	0.356
	Yes	52	55.9	41	44.1	
Life satisfaction						
Satisfied		210	72.7	79	27.3	<0.001***
Moderately		42	30.9	94	69.1	
Not satisfied		6	8.0	69	92.0	
Life satisfaction in next four years						
Satisfied		224	65.9	116	64.1	<0.001***
Moderately		31	27.7	81	72.3	
Not satisfied		3	6.3	45	93.8	
Grand mother lives in house	No	38	65.5	20	34.5	0.636
	Yes	63	618	39	38.2	
Two or more under 7 children in house	No	212	50.6	207	49.4	0.307
	Yes	46	56.8	35	43.2	
Two or more girl child in the family	No	213	52.1	196	47.9	0.650
	Yes	45	49.5	46	50.5	
Suitable accommodation	No	32	32.0	68	68.0	<0.001***
	Yes	226	56.5	174	43.5	
Adequate sanitation	No	32	32.3	67	67.7	<0.001***
	Yes	226	56.5	174	43.5	
House hold crowding	No	209	51.9	194	48.1	0.812
	Yes	49	50.5	48	49.5	
No of people in the house	Mean	4.27				0.742
Room in the house	Mean	1.62				<0.001***

5.2.5 Socioeconomic Characteristics of the Sample

Socioeconomic characteristics of the sample are presented in Table 16, which shows that only 7.6% of participants were working women while 68.4% were manual workers. Husband's income of more than half participants (58.6%) was less than 12,000/- RS and 39.0% of them were labeled as poor. We found that 60.8% of women were empowered. Around 80% of the women claimed that they had money for their basic needs and food. Families of around half of the women (47.2%) were in debt.

Table 16: Socioeconomic characteristics of the sample

Socioeconomic Factors	Categories	N	%
Women work status	No	462	92.4
	Yes	38	7.6
Women occupation	Manual	26	68.4
	Non manual	12	31.6
Women income	< 12,000	33	86.8
	12,001-21,000	5	13.2
	21,001 – 30,000	0	0
	>30,001	0	0
Husbands income	< 12,000	293	58.6
	12,001-21,000	140	28.0
	21,001 – 30,000	34	6.8
	>30,001	33	6.6
Total income	< 12,000	324	64.8
	12,001-21,000	59	11.8
	21,001 – 30,000	47	9.4
	>30,001	70	14.0
Women empowerment status	No	196	39.2
	Yes	304	60.8
Wealth index	Poorest	101	20.2
	Poor	195	39.0
	Average	100	20.0
	Rich	84	16.8
	Richest	20	4.0
Have money for basic needs	No	90	18.0
	Yes	404	80.8
	Don't know	6	1.2
Money for food	No	91	18.2
	Yes	391	78.2
	Don't know	18	3.6
Family debt	No	231	46.2
	Yes	236	47.2
	Don't know	33	6.6

5.2.6 Association of Socioeconomic Characteristics with Prenatal Depression

Socioeconomic factors were measured to explore association with depression. Table 17 shows this association. Working women who worked manually and earned less than 12,000 of income were mostly found depressed (65.4%) but the association was not significant statistically.

The husband's income ($p<0.01$), wife's empowerment status ($p<0.001$), and wealth index ($p<0.001$) had significant association with depression. Women who were not empowered and who belong to the poorest wealth quintile with their husband's income less than 12,000 were mostly depressed.

Moreover, significant association of depression was found with family debt ($p<0.001$), depression was high in those whose family were in debt as compared to their counterparts.

Most of the depressed women didn't have money for their basic needs and food and this association was highly significant (both $p<0.001$).

Table 17: Association of socioeconomic characteristics with depression

Socioeconomic Factors	Categories	Depression				
		No		Yes		
		N	%	N	%	p-value
Women empowerment						
No		242	52.4	220	47.6	0.223
Yes		16	42.1	22	57.9	
Women occupation						
Manual		9	34.6	17	65.4	0.169
Non manual		7	58.3	5	41.7	
Women income						
< 12,000		14	42.4	19	57.6	0.919
12,001-21,000		2	40.0	3	60.0	
21,001 – 30,000		0	0.0	0	0.0	
>30,001		0	0.0	0	0.0	
Husband Income						
< 12,000		134	45.7	159	54.3	<0.01**
12,001-21,000		83	59.3	57	40.7	
21,001 – 30,000		18	52.9	16	47.1	
>30,001		23	69.7	10	30.3	
Total income						
< 12,000		161	49.7	163	50.3	0.480
12,001-21,000		31	52.5	28	47.5	
21,001 – 30,000		24	51.1	23	48.9	
>30,001		42	60.0	28	40.0	
Women empowerment						
No		69	35.2	127	64.8	<0.001***
Yes		189	62.2	115	37.8	
Wealth index						
Poorest		27	26.7	74	73.3	<0.001***
Poor		92	47.2	103	52.8	
Average		63	63.0	37	37.0	
Rich		61	72.6	23	27.4	
Richest		15	75.0	5	25.0	
Have money for basic needs						
No		21	23.3	69	76.7	<0.001***
Yes		236	58.4	168	41.6	
Don’t know		1	16.7	5	83.3	
Money for food						
No		23	25.3	68	74.7	<0.001***
Yes		226	57.8	165	42.2	
Don’t know		9	50.0	9	50.9	
Family debt						
No		150	64.9	81	35.5	<0.001***
Yes		88	37.3	148	62.7	
Don’t know		20	60.6	13	19.4	

5.3 Stressful Life Events during the Past One Year

Stressful events in the life of the study population during the past one year have been summarized in Table 18. More than half the pregnant women (56%) answered positive to serious illness, death and suicide among close family members and 53% had financial problems followed by problems of livelihood 52.4% in the family. Likewise, 44.8% of the respondents had and event related to illness/accidents leading to hospitalization, and for 42.4% experiences changed in social status i.e. marriage, engagement, divorce or start of a new career. Above 40.8% were worried about problems related to their children. Around one fifth (21.2%) reported problems of residence, that is, change in residence making this the least common life event of those explored in the checklist.

Table 18: Stressful life events in past one year

S.NO	LEC	N	%
1	"You yourself or a closed relative of yours had been ill or had an accident which led to hospitalization"	224	44.8
2	"Any your close relative died or committed suicide or had gotten seriously ill"	281	56.2
3	"Has anyone in your family had problems of livelihood"	262	52.4
4	"You or someone in your family had any financial problems"	265	53.0
5	"You or someone in your family had changed in social status"	212	42.4
6	"You yourself have had any problem with your residence"	106	21.1
7	"Your relations with any of your close relative or friend have been troubled"	128	25.6
8	"Your marital relation with your spouse have had problem"	132	26.4
9	"You have been worried about your children's problems"	204	40.8
10	"You or other family member have had rows/quarrels amongst themselves"	124	24.8

5.3.1 Association of Stressful Life Events in the Past One Year with Prenatal Depression

Stressful life events in the last one year among pregnant women were measured to explore association with prenatal depression. These are summarized in Table 19 below. Among the list of ten events that were explored, livelihood problems ($P<0.01$), financial problems ($P<0.001$), troubled relations with any of close relative/friend ($P<0.001$), troubled marital relations ($P<0.001$), worry about children's health and education ($P<0.001$) and rows/quarrels amongst family members ($P<0.001$) were significantly associated with prenatal depression. Problems with residence ($P<0.001$), change in social status ($P<0.05$) and illness/accidents leading to hospitalization ($P<0.01$) were also associated with psychological distress.

Depression was equally prevalent (48%) among those women who had or had not experienced death or suicide of their close relatives and this association was not significant ($p>0.05$).

Table 19: Association of stressful life events in last one year with prenatal depression

			Depression				
			No		Yes		
			N	%	N	%	p-value
1.	"You yourself or a closed relative of yours had been ill or had an accident which led to hospitalization"	No	157	56.9	119	43.1	<0.01**
		Yes	101	45.1	123	54.9	
2.	"Any your close relative died or committed suicide or had gotten seriously ill"	No	113	51.6	106	48.4	0.999
		Yes	145	51.6	136	48.4	
3.	"Has anyone in your family had problems of livelihood"	No	142	59.7	96	40.3	<0.01**
		Yes	116	44.3	146	55.7	
4.	"You or someone in your family had any financial problems"	No	156	66.4	79	33.6	<0.001***
		Yes	102	38.5	163	61.5	
5.	"You or someone in your family had changed in social status"	No	144	50.0	144	50.0	<0.05
		Yes	114	53.8	98	46.2	
6.	"You yourself have had any problem with your residence"	No	229	58.1	165	41.9	<0.001***
		Yes	29	27.4	77	72.6	
7.	"Your relations with any of your close relative or friend have been troubled"	No	225	60.5	147	39.5	<0.001***
		Yes	33	25.8	95	74.2	
8.	"Your marital relation with your spouse have had problem"	No	221	60.1	147	39.9	<0.001***
		Yes	37	28.0	95	72.0	
9.	"You have been worried about your children's problems"	No	193	65.2	103	34.8	<0.001***
		Yes	65	31.9	139	68.1	
10.	"You or other family member have had rows/quarrels amongst themselves"	No	222	59.0	154	41.0	<0.001***
		Yes	36	29.0	88	71.0	

To assess the cumulative effect of multiple stressful events, these were added and the total numbers categorized into ≤2, 3-4 and ≥5 events in the previous year. Depression was significantly associated with stressful life events ($p<0.001$), women who had three or more stressful life events were more depressed than who had less than 3, as shown below

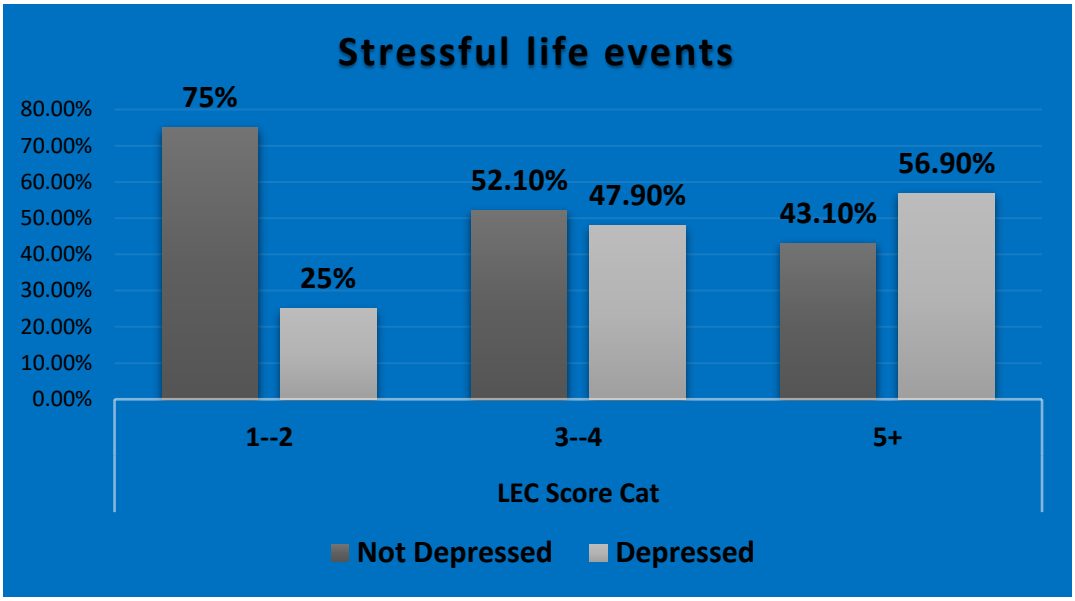

Figure 10: Association of depression with stressful life events in last one year

5.4 Multidimensional scale of perceived social support (MSPSS)

For the purpose of analysis, the Likert scale responses of the multidimensional scale pf perceived social support (MSPSS) were merged into 3 categories as follows: “disagree: (merging 1, very strongly disagree 2, disagree: and 3 somewhat disagree): “agree (merging 5, somewhat agree: 6, agree: and 7 very strongly agree); the final category was “neither agree nor disagree” (4 on the scale). According to these categories, current levels of perceived social support have been summarized in Table 20.

MSPSS demonstrates that current levels of social support were high in case of significant other (corresponding to the first four questions) and family (corresponding to the middle four questions). As can be more than 70% of the respondents felt they had good support from their significant other and family subscale. On the contrary, social support from the friend’s subscale (corresponding to the last four questions) was relatively lower. Only one third of the participants agreed that they had support from friends.

Table 20: Multidimensional scale of perceived social support

MSPSS	Disagree		Balance		Agree	
	N	%	N	%	N	%
"There is special person who is around when I am in need"	139	27.8	6	1.2	355	71.0
"There is special person with whom I can share my joys and sorrows"	121	24.2	8	1.6	371	74.2
"I have a special person who is a real source of comfort to me"	106	21.2	17	3.4	377	75.4
"The is special person in my life who care about my feelings"	126	25.2	17	3.4	357	71.4
"My family really tries to help me"	119	23.8	37	7.4	344	68.8
"I get the emotional help and support I need from my family"	121	24.2	26	5.2	353	70.6
"I can talk about my problems with my family"	126	25.2	28	5.6	346	69.2
"My family is willing to help me make decision"	127	25.4	22	4.4	351	70.2
"My friends really try to help me"	284	56.8	25	5.0	191	38.2
"I can count on my friends when things go wrong"	288	57.6	35	7.0	177	35.4
"I have friends with whom I can share my joys and sorrows"	267	53.4	22	4.4	211	42.2
"I can talk about my problems with my friends"	255	51.0	21	4.2	224	44.8

MSPSS: multi-dimensional scale of perceived social support

5.4.1 Association of perceived social support with prenatal depression

Association of the perceived level of social support with prenatal depression is presented in Table 21. Pregnant women with prenatal depression had significantly less perceived social support (35.31±15.99) as compared to women without depression (48.88±11.07).

In addition, the association of each category of perceived social support was compared separately with parental depression, as is shown in the table below. Depressed women significantly perceived less social support on the three subscales of significant other (mean difference 5.29, $p<0.001$), family (mean difference 5.33, $p<0.001$) and friends (mean difference 2.93, $p<0.001$).

Table 21: Perceived social support and association with prenatal depression

MSPSS	**Depression**						
	No		Yes				
	Mean	Std. Deviation	Mean	Std. Deviation	Mean difference	Confidence interval	p- Value
"There is special person who is around when I am in need"	4.58	1.21	3.099	1.99	148	1.19,1.77	<0.001***
"There is special person with whom I can share my joys and sorrows"	4.66	1.09	3.30	1.97	1.36	1.08,1.64	<0.001***
"I have a special person who is a real source of comfort to me"	4.61	1.15	3.52	1.89	1.09	0.82,1.37	<0.001***
"The is special person in my life who care about my feelings"	4.58	1.20	3.22	1.93	136	1.07,1.64	<0.001***
Score on significant other subscale	**18.43**	**3.86**	**13.14**	**6.75**	**5.29**	**4.32,6.27**	<0.001***
"My family really tries to help me"	4.56	1.16	3.20	1.90	1.36	1.08,1.64	<0.001***
"I get the emotional help and support I need from my family"	4.55	1.19	3.26	1.92	1.29	1.00,1.57	<0.001***
"I can talk about my problems with my family"	4.56	1.17	3.16	1.93	1.40	1.12,1.68	<0.001***
"My family is willing to help me make decision"	4.52	1.24	3.23	1.94	1.29	0.99,1.58	<0.001***
Score on family subscale	**18.9**	**4.02**	**12.85**	**6.99**	**5.33**	**4.32,6.35**	<0.001***
"My friends really try to help me"	2.99	1.94	12.24	1.81	0.75	0.42,1.08	<0.001***

"I can count on my friends when things go wrong"	2.97	1.92	2.12	1.73	0.85	0.53,1.17	<0.001***
"I have friends with whom I can share my joys and sorrows"	3.10	1.94	2.43	1.89	0.67	0.33,1.01	<0.001***
"I can talk about my problems with my friends"	3.19	1.95	2.54	1.91	0.66	0.32,0.99	<0.001***
Score on friends subscale	**12.26**	**7.17**	**9.32**	**6.58**	**2.93**	**1.73,4.14**	<0.001***
MSPSS total	**48.88**	**11.07**	**35.31**	**15.99**	**13.56**	**11.13, 15.99**	<0.001***

MSPSS: multi-dimensional scale of perceived social support

5.5 Women's Autonomy

Women's autonomy comprises of two broad categories. One is women autonomy in spending their own and husband's income and the other is participation of women in different types of decision-making.

5.5.1 Women's Autonomy over Own and Husband's earning and Decision-making

Employment and earning, women's control over their earning, control over husband's earnings and women's participation in decision-making about their own health care are some of the factors related to women's autonomy and is shown in Table 22. Most of the study population (90.8%) did not work in the last on year. Those who did work (9.2%), 89.1% received cash and 10.9% received compensation other than money. The working women who had full control over their earnings were 6.2%. In cases where the husband was the earning member, exclusive control of women drops to 5% and other family members seem to have a greater control (35.6%). When it comes to women's participation in decision-making about their own health care, the husband is mostly in control (25.8%) as compared to the women themselves (14.8%).

Table 22: Factors related to women autonomy

Women autonomy factors	Categories	N	%
Employment and earnings			
Work in last 12 months	No	454	90.8
	Yes	46	9.2
Received cash for works	No	5	10.9
	Yes	41	89.1
Received compensation other than money for work	No	41	89.1
	Yes	5	10.9
Women's control over their own earnings			
Person who decides how the money and goods you receive are used	You only	31	6.2
	Your husband only	4	0.8
	Both	5	1.0
	You & other family	1	0.2
	Other members only	5	1.0
	No earnings	454	90.8
Control over husband's earnings			
Person who decides how your husband's earnings are used	You only	25	5.0
	Your husband only	144	28.8
	Both	84	16.8
	You & other family	20	4.0
	Other members only	178	35.6
	Husband has no earnings	49	9.8

Women's participation in decision making about own health care	You only	74	14.8
	Your husband only	129	25.8
	Both	102	20.4
	You & other family	47	9.4
	Other members only	148	29.6
Major household purchases	You only	16	3.2
	Your husband only	157	31.4
	Both	70	14.0
	You & other family	42	8.4
	Other members only	215	43.0
Visit to family or relatives	You only	43	8.6
	Yours husband only	154	30.8
	Both	95	18.8
	You & other family	37	7.4
	Other members only	172	34.4

5.5.2 Association of Women's Control over Earning with Prenatal Depression

It was observed that the mothers who did not receive cash and were given just compensation for their work (5 out of a total of 46 working mothers) were all in the depression category. Control over their own and their husband's earnings did not show any significant association with prenatal depression (both $p>0.05$).

Table 23: Association of Women's Control over Earning with Prenatal Depression

Women's autonomy factors	Categories	Depression				p-value
		No		Yes		
		N	%	N	%	
Employment and earnings						
Work in last 12 months	No	235	51.8	219	48.2	0.82
	Yes	23	50.0	23	50.0	
Received cash for works	No	238	51.9	221	48.1	0.706
	Yes	20	48.8	21	51.2	
Received compensation other than money for work	No	258	52.1	237	47.9	<0.05*
	Yes	0	00.0	5	100	
Women's control over their own earnings						
Person who decides how the money and goods you receive are used	You only	15	48.4	16	51.6	0.057
	Your husband	1	25.0	3	75.0	
	Both	2	40.0	3	60.0	
	You & others	1	100.0	0	0.0	
	Other members	4	80.0	1	20.0	
	No earnings	235	51.8	219	48.2	
Control over husband's earnings						
Person who decides how your husband's earnings are used	You only	14	56.0	11	44.0	0.175
	Your husband	73	50.7	71	49.3	
	Both	43	51.2	41	48.8	
	You & others	14	70.0	6	30.0	
	Other members only	96	53.9	82	46.1	
	Husband has no earnings	18	36.7	31	63.3	

5.5.3 Association of Women's participation in Decision-making with Prenatal Depression

Among the mothers who had to make a decision about their own health (62.2%) were depressed as compared to 37.8% who were not depressed ($p<0.05$). In major household purchases, 57% of depressed mothers and 42.9% of non-depressed mothers made decisions along with their husbands ($p<0.05$). Total 69.8% of non-depressed and only 30.2% of depressed women were allowed to visit family members on their own ($p<0.05$). Moreover, 59.6% of depressed mothers and 40.4% of non-depressed mothers were not allowed to go to the market on their own ($p<0.01$). Finally, 70.2% of depressed women did not have time for themselves as compared to 29.8% non-depressed mothers ($p<0.01$).

Table 24: Association of Women's Decision-making with Prenatal Depression

Women's decision making factors	Categories	Depression				p-value
		No		Yes		
		N	%	N	%	
Women's participation in decision making about						
Own health care	You only	28	37.8	46	62.2	<0.05*
	Your husband only	60	46.5	69	53.5	
	Both	59	57.8	43	42.2	
	You & other family	31	66.0	16	34.0	
	Other members	80	54.1	68	45.9	
Major household purchases	You only	9	56.3	7	43.8	<0.05*
	Your husband only	76	48.4	81	51.6	
	Both	30	42.9	40	57.1	
	You & other family	26	61.9	16	38.1	
	Other members	117	54.4	98	45.6	
Visit to family or relatives	You only	30	69.8	13	30.2	<0.05*
	Your husband only	66	42.9	88	57.2	
	Both	48	51.1	46	48.9	
	You & other family	23	62.2	14	37.8	
	Other members only	91	52.9	81	47.8	
Most of the time, are you allowed to go to the market?	No	44	40.4	65	59.6	<0.01**
	Yes	214	54.7	177	45.3	
Are you allowed to go alone?	No	198	50.8	192	49.2	<0.484
	Yes	60	54.5	50	45.5	
Most of the time, are you allowed to go to the places outside this village?	No	58	43.3	76	56.7	<0.05*
	Yes	200	54.6	166	45.4	
Are you allowed to go alone?	With someone	196	50.5	192	49.5	<0.366
	Else	62	55.4	50	44.6	
Do you have time to do things for yourself?	No	34	29.8	80	70.2	<0.01**
	Yes	193	63.9	109	36.1	
	Sometimes	31	36.9	53	63.1	

5.5.4 Cumulative Scores of Autonomy

Scores were calculated for women's decision-making based on control over their own and their husband's income, their own health, major and minor household purchases and visits to family and friends. Lower third scores showed low autonomy, middle third scores showed moderate and upper third were for high autonomy. More of the non-depressed pregnant women had low and moderate autonomy scores whereas high autonomy scores were for the depressed women but the number is too low in this category. The difference in the mean scores was not statistically significant.

Table 25: Cumulative Autonomy score

Cumulative Autonomy Score	Depression				p-value
	No		Yes		
		%	N	%	
Low	107	54.6	89	45.4	0.697
Moderate	147	51.0	141	49.0	
High	4	25.0	12	75.0	

5.6 Intimate partner violence (IPV)

In the present study we tried to gather information on intimate partner violence by asking the questions on psychological, physical and sexual aspects.

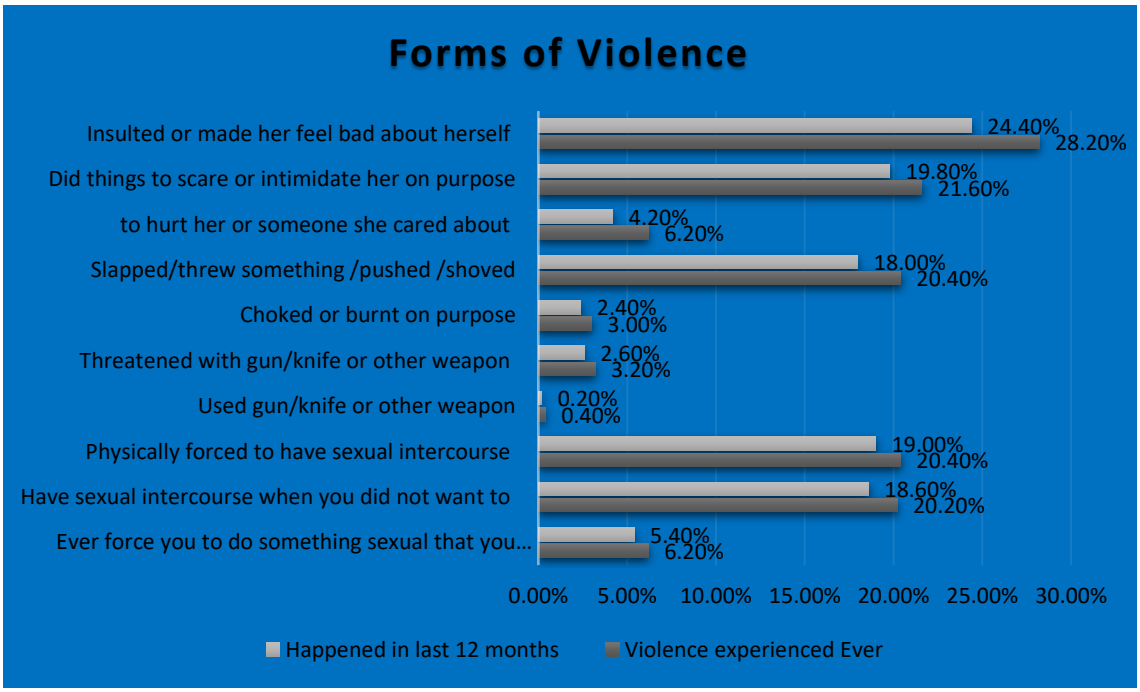

Figure 11: Distribution of various forms of violence

Proportions of various forms of violence in last 12 months and ever experienced by women are presented in figure 12. It was observed that 28.2% of women felt insulted by their partner at least once in their relationship and 24% experienced their insult in the last 12 months. Around 18% and 20% of women had sexual intercourse against their wish in the last 12 months or ever in married life respectively and similar frequencies were observed in the women who experienced physical violence in the form of a slap, throw or push.

5.6.1 Prevalence of IPV

Figure 11 shows the prevalence of all types of IPV whether psychological, physical or sexual. Prevalence is calculated on the basis of 'yes' to any single question related to any types of IPV. Psychological and sexual IPV were equally experienced (38%) by women while physical IPV was least among three (26%).

5.6.2 Descriptive about IPV

A total 28.2% of mothers were insulted or were made to feel bad about them and 13% of women had this done to them more than 6 times. One fifth of mothers (20.4%) were both physically and sexually abused by their husbands or partners as shown in Table 26. Overall 18% of women were slapped by their counterparts in less than 12 months and 9.2% experienced this 1-2 times. It was observed that 18.6% of women had sexual intercourse without their consent and 8.8% experienced these more than 6 times.

Table 26: Frequencies of IPV Experienced

Forms of violence	Violence experienced yes		Happened in last 12 months		Number of events					
	Yes		Yes		1-2 Times		3-5 Times		6+ Times	
	N	%	N	%	N	%	N	%	N	%
IPV psychological										
"Insulted or made her feel bad about herself**"**	414	28.2	122	24.4	32	6.4	25	5.0	65	13
"Did things to scare or intimidated her on purpose"	108	21.6	99	19.8	31	6.2	26	5.2	42	8.4
"To hurt her someone she care about"	31	6.2	21	4.2	6	1.2	7	1.4	8	1.6
IPV physical										
"Slapped /threw something/pushed/shoved "	102	20.4	90	18.0	46	9.2	22	4.4	22	4.4
"Choked or burnt on purpose"	15	3.0	12	2.4	3	0.6	4	0.8	5	1.0
"Threatened with gun /knife or other weapon"	16	3.2	13	2.6	4	0.8	4	0.8	5	1.0
"Used gun /knife or other weapon"	2	0.4	1	0.2	1	0.2	0	0.0	0	0.9
IPV sexual										
"Physical force to have sexual intercourse"	102	20.4	95	19.0	23	4.6	29	5.8	42	8.4
"Have sexual intercourse when did not want to"	101	20.2	93	18.6	20	4.0	29	5.8	44	8.8
"Ever force you to do something sexually that you found degrading or humiliating"	31	6.2	27	5.4	10	2.0	5	1.0	12	2.4

5.6.3 Association of psychological IPV and Prenatal Depression

While analyzing the association between intimate partner violence and prenatal depression, we found that 75.2% of mothers who were exposed to psychological insults by their husbands were depressed as compared to 24.8% who were not depressed. Moreover, the frequency of such episodes was also found to be of significance as the greater number of times the mother was insulted (> 6 times), the greater number of mothers were found depressed (86.2%, $P<0.01$). If the intimate partner tried to scare or intimidate the mother on purpose, for example, by the way of looking at her or by yelling and smashing things, and if this happened more than 6 times in the last one year, 92.9% of mothers were found depressed as compared to 7.1% who were not depressed ($P<0.01$). The frequency of depression was almost double 68.9% in women who had undergone psychological IPV as compared to those who did not experience psychological IPV (31.1%) and this relation was found highly significant ($P<0.01$) as shown in Table 27.

Table 27: Association of Psychological IPV with Prenatal Depression

IPV psychological	Categories	Depression				
		No		Yes		
		N	%	N	%	p-value
"Has your husband ever insulted you or made you feel bad about yourself?"	No	209	63.0	123	37.0	<0.01**
	Yes	85	24.8	106	75.2	
	No response	14	51.9	13	48.1	
"Has this happened in the last 12 months?"	No	6	33.3	12	66.7	<0.01**
	Yes	29	23.8	93	76.2	
	No response	223	61.9	137	38.1	
"Has this happened one or two times, three to five times, 6 or more than 6 times"	1-2 times	13	40.6	19	59.4	<0.01**
	3-5 times	7	28.0	18	72.0	
	6+ times	9	13.8	56	86.2	
	No response	229	60.6	149	39.4	
"Done things that scared or intimated you on purpose, for example, by the way he looked at you, or by yelling or smashing things?"	No	220	60.1	146	39.9	<0.01**
	Yes	25	23.1	83	76.9	
	No response	13	50.0	13	50.0	
"Has this happened in past 12 months"	No	1	11.1	8	88.9	<0.01**
	Yes	24	24.2	75	75.8	
	No response	233	59.4	159	40.6	
"Has this happened one or two times, three to five times, 6 or more than 6 times"	1-2 times	15	48.4	16	51.6	<0.01**
	3-5 times	6	23.1	20	76.9	
	6+ times	3	7.1	39	92.9	
	No response	234	58.4	167	41.6	
"Threatened to hurt you or someone you cared about"	No	241	54.5	201	45.5	<0.01**

	Yes	3	9.7	28	90.3	
	No response	14	51.9	13	48.1	
"Has this happened in past 12 months"	No	2	20.0	8	80.9	<0.01**
	Yes	1	4.8	20	95.2	
	No response	255	54.4	214	45.6	
"Has this happened one or two times, three to five times, 6 or more than 6 times"	1-2 times	1	16.7	5	83.3	<0.01**
	3-5 times	0	0.0	7	100.	
	6+ times	0	0.0	8	100.	
	No response	257	53.7	222	46.3	
Cumulative psychological score (if yes to any one)	**No**	**199**	**64.2**	**111**	**35.8**	**<0.01****
	Yes	**59**	**31.1**	**131**	**68.9**	

5.6.4 Association of Physical IPV and Prenatal Depression

Physical violence was assessed by asking the study population whether they were slapped or pushed or chocked or were threatened with a gun, knife or other weapons by their intimate partners. The results are presented in Table 28. Depression was high in women who had experienced any type of physical violence than others except those in which partner actually used the gun or any types of weapon against women, in this situation we found that 50% were depressed and half of them were non-depressed and the association was not significant but we cannot say anything about this with surety as the frequency in each category was very less (i.e.1). Depression was more (73.1%) in women who had experienced or said yes to any of the physical violence ($p<0.01$).

Table 28: Association between physical IPV and prenatal depression

Categories		Depression				P-Value
		No		Yes		
		Count	Row N %	Count	Row N %	
IPV Physical						
Slapped you or thrown something at you that could hurt you? Pushed you or shoved you or pulled your hair?	No	222	59.8	149	40.2	<0.01**
	Yes	22	21.6	80	78.4	
	No Response	14	51.9	13	48.1	
Has this happened in the past 12 Months?	No	3	25.0	9	75.0	<0.01**
	Yes	19	21.1	71	78.9	
	No Response	236	59.3	162	40.7	
Has happened one or two times, three to five times, 6 or more than 6 times	1-2 Times	12	26.1	34	73.9	<0.01**
	3-5 Times	5	22.7	17	77.3	
	6+ Times	2	9.1	20	90.9	
	No Response	239	58.3	171	41.7	
Choked or burnt you on purpose?	No	243	52.9	216	47.1	0.11
	Yes	2	13.3	13	86.7	
	No Response	13	50.0	13	50.0	
Has this happened in the past 12 Months?	No	0	0.0	3	100.0	<0.01**
	Yes	2	16.7	10	83.3	
	No Response	256	52.8	229	47.2	
has happened one or two times, three to five times, 6 or more than 6 times	1-2 Times	0	0.0	3	100.0	
	3-5 Times	1	25.0	3	75.0	0.091
	6+ Times	1	20.0	4	80.0	
	No Response	256	52.5	232	47.5	
Threatened to use a gun, knife or other Weapon against you?	No	242	52.8	216	47.2	<0.05*
	Yes	3	18.8	13	81.3	
	No Response	13	50.0	13	50.0	
Has this happened in the past 12 Months?	No	1	33.3	2	66.7	<0.05*
	Yes	2	15.4	11	84.6	
	No Response	255	52.7	229	47.3	
You say that this has happened one or two times, three to five times, 6 or more than 6 times	1-2 Times	2	50.0	2	50.0	
	3-5 Times	0	0.0	4	100.0	<0.05*
	6+ Times	0	0.0	5	100.0	
	No Response	256	52.6	231	47.4	
Actually used a gun, knife or other weapon against you?	No	244	51.7	228	48.3	0.985
	Yes	1	50.0	1	50.0	
	No Response	13	50.0	13	50.0	
Has this happened in the past 12 Months?	No	0	0.0	1	100.0	0.367
	Yes	1	100.0	0	0.0	
	No Response	257	51.6	241	48.4	
Has happened one or two times, three to five times, 6 or more than 6 times	1-2 Times	1	100.0	0	0.0	
	3-5 Times	0	0.0	0	0.0	
	6+ Times	0	0.0	0	0.0	
	No Response	257	51.5	242	48.5	
Cumulative physical violence score	No	223	60.3	147	39.7	<0.01**
	Yes	35	26.9	95	73.1	

5.6.5 Sexual IPV and Prenatal Depression

Sexual violence was assessed by asking the respondents whether their husband ever physically forced them to have sexual intercourse when they did not want to or they had sexual intercourse only because they were afraid of what their husband might do and whether their husband ever forced them to do something sexual that they found degrading or humiliating. The cumulative score for the above questions as shown in Table 29 was found to be affirmative in 62.8% of depressed and 37.2% of non-depressed mothers ($P<0.01$).

While assessing the association of each variable related to sexual IPV with depression, we found that the women who were exposed to sexual IPV were more depressed than those who were not and this association of depression was statistically significant with each individual variable.

Table 29: Association of sexual IPV with prenatal depression

IPV Sexual	Categories	Depression				
		No		Yes		
		N	%	N	%	p-value
"Did your husband ever physically force you to have sexual intercourse when you did not want to?"	No	202	57.5	149	42.5	<0.01**
	Yes	26	25.5	76	74.5	
	No response	30	63.8	17	36.2	
"Has this happened in the past 12 months?"	No	2	33.3	4	66.7	<0.01**
	Yes	24	25.3	71	74.7	
	No response	232	58.3	166	41.7	
"Has happened one or two times, three to five times, 6 or more than 6 times"	1-2 times	10	43.5	13	56.5	<0.01**
	3-5 times	4	13.8	25	86.2	
	6+ times	10	23.8	32	76.2	
	No response	234	57.8	171	42.2	
"Have sexual intercourse when did not want to because you were afraid of what your husband might do?"	No	202	57.4	150	42.6	<0.01**
	Yes	25	24.8	76	75.2	
	No response	30	65.2	16	34.8	
"Has this happened in past 12 months"	No	0	0.0	8	100.0	<0.01**
	Yes	25	26.9	68	73.1	
	No response	233	58.9	166	41.6	
"Has this happened one or two times, three to five times, 6 or more than 6 times"	1-2 times	7	35.0	13	65.0	<0.01**
	3-5 times	10	34.5	19	65.5	
	6+ times	8	18.2	36	81.8	
	No response	233	57.2	174	42.8	
"Your husband ever forced you to do something sexually that you found degrading or humiliating?"	No	225	53.2	198	46.8	<0.01**
	Yes	3	9.7	28	90.3	
	No response	30	65.2	16	34.8	
"Has this happened in past 12 months"	No	1	25.0	3	75.0	<0.01**
	Yes	2	7.4	25	92.6	
	No response	255	54.4	214	45.6	

"You say that this has happened 1 or two times, 3-5 times, 6 or more than 6 times"	1-2 times	1	10.0	9	90.0	<0.01**
	3-5 times	0	0.0	5	100.0	
	6+ times	1	8.3	11	91.7	
	No response	256	54.1	217	45.9	
Cumulative sexual violence score (if yes to any one)	**No**	**188**	**60.3**	**124**	**39.7**	**<0.01****
	Yes	**70**	**37.2**	**118**	**62.8**	
"How often were you afraid that your husband might do some of these things we have talked about, like hurting you physically or forcing you sexually?"	Always	2	22.2	7	77.8	<0.01**
	Often	0	0.0	11	100.0	
	Sometimes	5	21.7	18	78.3	
	Rarely	2	11.8	15	88.2	
	Never	31	41.3	44	58.7	
	No response	218	59.7	147	40.3	

5.7 Maternal Social Support

While looking into maternal social support, it was seen that in our study population 317 (63.4%) women fixed the meals themselves and 88.8% informed that someone else did grocery shopping. About 56% of women clean their houses by themselves but only 18% of them fix the things around house while 61.4% said that house matters were settled by someone else as shown in Table 30. More than 90% of women said that someone else paid the bills. When their children fell ill, only 11.6% of women took them to doctors while 27% said that someone else carried them to the doctor.

Table 30: Maternal social support Index MSSI (descriptive)

MSSI		N	%
Who fixes meals? Do…	You generally do it	317	63.4
	Generally, someone else do it	47	9.4
	You and someone else do it	135	27.0
	No one	1	0.2
Who does the grocery shopping? Do…	You generally do it	34	6.8
	Generally, someone else do it	444	88.8
	You and someone else do it	20	4.0
	No one	2	0.4
Who lets your children know what is right or wrong? Do…	You generally do it	132	26.4
	Generally, someone else do it	21	4.2
	You and someone else do it	190	38.0
	No one	157	31.4
Who fixes things around the house or apartment?	You generally do it	91	18.2
	Generally, someone else do it	307	61.4
	You and someone else do it	84	16.8
	No one	18	3.6
Who does the cleaning?	You generally do it	280	56.0
	Generally, someone else do it	43	8.6
	You and someone else do it	176	35.2
	No one	1	0.2
Who pays the bills?	You generally do it	6	1.2
	Generally, someone else do it	467	93.4
	You and someone else do it	16	3.2
	No one	11	2.2
Who takes your children to the doctor if he/she is sick?	You generally do it	58	11.6
	Generally, someone else do it	135	27.0
	You and someone else do it	153	30.6

	No one	154	30.8
Who sees to it that your children go to bed?	You generally do it	272	54.4
	Generally, someone else do it	20	4.0
	You and someone else do it	47	9.4
	No one	161	32.2
In general, would you like to see your relatives…?	You generally do it	122	24.4
	Generally, someone else do it	94	18.8
	You and someone else do it	267	53.4
	No one	17	3.4

5.7.1 Association of Maternal Social Support with Prenatal Depression

Table 31 shows that 172 (54.1%) women reported to be depressed ($p<0.001$) among those who fix meals by themselves. For 444 women (88.8%), the grocery shopping was done by someone else along with them and 216 (48.2%) of mothers in this category said that they were depressed. When they were asked who lets their children know the difference between right and wrong, 190 (38%) said that someone else does it and 89 (46.8%) of those women were depressed but this association was not significant. The task of fixing things in the house was done by 109 (21.8%) women, out of which 71 (65.1%) were depressed ($p<0.001$). Women who cleaned the house themselves were 281 (56.2%) and out of these 152 (54.1%) were depressed ($p<0.001$). The bills were generally paid by themselves with someone else for 467 of the participants (93.4%), out of which 228 (48.8%) of women were depressed. In case children fell sick, 211 mothers (42.4%) took them to the doctor themselves and 98 (46.2%) of these women said that they were depressed. Most of the women 433 (86.6%) put their children to bed and out of these 210 (48.5%) were depressed. About one quarter of women 139 (27.8%) went to see their relatives on their own and 70, (50.4%) of them were depressed, while depression was high among those women who went to see their relatives along with someone else (58.5%) and this association was significant ($p<0.05$)

Table 31: Association between maternal social support and prenatal depression

MSSI	Categories	Depression				
		No		Yes		
		N	%	N	%	p-value
Who fix meals? Do…	You or no one	146	45.9	172	54.1	<0.001***
	She & someone else	23	48.9	24	51.1	
	Someone else	89	65.9	46	34.1	
Who does the grocery shopping? Do…	You or no one	15	41.7	21	58.3	0.055
	She & someone else	228	51.4	216	48.6	
	Someone else	15	75.0	5	25.0	
Who lets your children know what is right or wrong? Do…	You or no one	147	50.9	142	49.1	0.827
	She & someone else	10	47.6	11	52.4	
	Someone else	101	53.2	89	46.8	
Who fix things around the house or apartment?	You or no one	38	34.9	71	65.1	<0.001***
	She & someone else	164	53.4	143	46.6	
	Someone else	56	66.7	28	33.3	
Who does the cleaning?	You or no one	129	45.9	152	54.1	<0.001***
	She & someone else	17	39.5	26	60.5	
	Someone else	112	63.6	64	36.4	
Who pays the bills?	You or no one	8	47.1	9	52.9	0.357
	She & someone else	239	51.2	228	48.8	
	Someone else	11	68.8	5	31.3	
Who takes your children to the doctor if he/she is sick?	You or no one	114	53.8	98	46.2	0.663
	She & someone else	69	51.1	66	48.9	
	Someone else	75	49.0	78	51.0	
Who sees to it that your children go to bed?	You or no one	223	51.5	210	48.5	0.705
	She & someone else	12	60.0	8	40.0	
	Someone else	23	48.9	24	51.1	
In general, would you like to see your relatives…?	You or no one	69	49.6	70	50.4	<0.05*
	She & someone else	39	41.5	55	58.5	
	Someone else	150	56.2	117	43.8	

For MSSI, scores on various responses were summed and a cumulative score was calculated. It can be seen in Table 32 that those who were non-depressed have higher mean score as compared to the depressed and the difference was statistically significant (p<0.001).

Table 32: Association of MSSI Score and Prenatal Depression

		N	MSSI Score Mean	Std. Deviation	Mean difference	Confidence interval	p- Value
Depression	No	258	16.01	6.07	2.05	0.99,3.11	<0.001***
	Yes	242	13.96	6.02			

5.8 Generalized Linear Model for Association of Risk Factors with Prenatal Depression

After univariate and bivariate analysis, a final model to show the association of socio demographic variables, life events, perceived social support, social support, women's autonomy, decision-making and IPV with prenatal depression was fitted.

Among the maternal factors, number of pregnancies was significantly associated with prenatal depression (p<0.01, OR 2.3, CI 1.33-3.91). Odds of depression among women who had 4-6 pregnancies were two times higher as compared to those who had less than 3 pregnancies.

Second significant variable was family structure. Those women who were living in a joint family system had 2 times higher odds of being depressed (p<0.05, OR 1.9, CI 1.06-3.55) as compared to those living in nuclear family structure.

Perception of life satisfaction in the next 4 years was also significantly associated with depression. Odds of having depression was 2.4 (p<0.01, OR 2.4, CI 1.39-4.29) times more in women who perceived themselves as moderately satisfied with their life in the next four years than those who were satisfied. Likewise, odds of depression was seven (p<0.01, OR 6.9, CI 1.77-26.73) times more in women who would not be satisfied with their life in the next four years than those who would be satisfied.

Depression was also associated significantly with suitable accommodation. Women who claimed that they had suitable accommodation had a 0.5 times less chances of having depression than others ($p<0.05$, OR 0.5, CI 0.27-0.92).

Odds of having depression in women who experienced more than five stressful life events in last one year was three times higher ($p<0.001$, OR 3.2, CI 1.68-5.98) than in women with 1-2 stressful events.

Social support to women also had significant association with depression. Women who were supported by their significant others had a 0.9 times ($p<0.01$, OR 0.9, CI 0.85-0.96) less chances of getting depressed than those who had support from friends. Similarly, odds of developing depression in women who had support from family members was 0.9 times less than women who had support from friends ($p<0.01$, OR 0.9, CI 0.89-0.98).

Women who were psychologically abused by their partners during pregnancy had 1.5 odds of being depressed with $p<0.05$ CI 1.12, 2.51

Odds of having depression was also high in women who had less mean score of MSSI ($p<0.05$, OR 1.1, CI 1.01-1.09).

The rest of the factors like husband income, having 3-4 stressful life events, living with multiple families and having more than 6 pregnancies were not significantly associated with depression as shown in Table 33.

Table 33: Generalized linear model for association of risk factors with prenatal depression

Variable	Categories	Odds ratio	95% CI of Odds ratio	p-value
Maternal/obstetrics factors	<3(ref)	2.3	1.33,3.91	0.008
No of pregnancies	4-6	2.2	0.74,6.53	<0.01**
	>6			0.159
Family factors				
Family structure	Nuclear (ref)			0.089
	Joint	1.9	1.06,3.55	<0.05*
	Multiple	1.9	0.84,4.05	0.124
Life satisfaction in next 4 years	Satisfied (ref)			
	Moderately satisfied Not	2.4	1.39,4.29	<0.01**
	satisfied	6.9	1.77,26.73	<0.01**
Suitable accommodation	Yes	0.5	0.27,0.92	<0.05*
Husband income	<12,000(ref)			
	12,001-21,000	0.8	0.46,1.27	0.29
	21,000-30,000	1.4	0.60,3.24	0.44
	>30,001	0.4	0.17,1.15	0.09
LEC score	1-2 (ref)			0.12
	3-4	1.7	0.86,3.38	<0.001***
	5+	3.2	1.68,5.98	
IPV Psychological	Yes	1.5	1.12,2.51	<0.05*
Maternal social support				
	Family	0.9	0.89,0.98	<0.01**
MSSI Score		1.1	1.01,1.09	<0.05*

5.9 Summary of the Chapter

Only gravid women either in second or third trimester were included in the study. Most of the participants around 60% were 23-30 years old with at least one live child. About 39% of women had at least primary education, while husbands of almost half of the participants had secondary or higher education. Half of the participants had normal pre-pregnancy BMI.

Majority lived in a joint family system in non-crowded houses. Husbands of more than 80% of women were not living away from the house for the last six months. Around 60% of participants were satisfied with life.

More than half the participants belonged to families of the poorest and poor wealth quintiles. Husbands of most of the participants were working manually with a monthly income of less than 12,000 Rupees. Only 7.6% of women were working and most of them were manual workers. Families of nearly half of the participants were in debt.

A majority of the women who were depressed belonged to older age group and with less education. Depression was significantly associated with mother's education, their health status, place of delivery, number of pregnancies and number of living children.

In family factors, a significant association of depression was found with husband's education, employment, women's life satisfaction, suitable accommodation and adequate sanitation.

Among the socioeconomic factors, husband's income, wife empowerment, wealth index, availability of money for basic needs and food and family debt were associated with depression.

Regarding stressful life events more than half of the women reported that they came across with death or serious illness of their close relative during the last year, their relatives had financial or livelihood problems. Depression was found significantly associated with all different forms of stressful life events with the exception of death or illness of family relatives. Depression was significantly related and higher in women who experienced >5 stressful life events during past one year.

Around 70% of the respondents felt they had good support from their significant other and family subscale. Women who had less support from their significant other, family or friends were more depressed than others and this association was extremely significant ($p<0.001$).

Only 5% and 6% of women had control over their husbands and own earnings respectively but the association with depression was not significant. Only 14% of women reported to participate in decision-making about their own health. Depression was significantly associated with decision-making regarding matters concerning the

women's own health, major household purchases, and visits to family, market and outside the village.

Around 38% of women reported sexual and psychological IPV, while physical IPV was 26%. Women who had a high cumulative physical, sexual or psychological IPV score were more depressed than others and the association was statistically significant.

Regarding maternal social support, 317 (63.4%) women fixed meals themselves and 88.8% informed that someone else did the grocery shopping. Women, who did grocery shopping for the house, fixed meals and fixed things around house by themselves were more depressed and this association was significant. Depression was less in women who had high MMS score mean and this was also significant.

Generalized Liner Model of association of depression with other variables showed significant protective association with suitable accommodation and having perceived social support from family members. Risk factors for prenatal depression were having 4-6 pregnancies, living in a joint family system, perception of being moderately satisfied and not satisfied with life in the next 4 years, psychological abuse by intimate partners and enduring more than 5 stressful life events in the last one year.

CHAPTER 6

DISCUSSION

6.1 Introduction

This is one of the few epidemiological studies to assess the prevalence of prenatal depression and explore the association of prenatal depression with dietary practices among women in second and third trimester living in the rural area of district Rawalpindi, Pakistan. In the first part of this study factors associated with prenatal depression were explored.

This chapter is organized in such a way that at first the key findings of the first part of the study are summarized, and then the methodological issues in the study are discussed along with identification of its strengths and weaknesses. The main findings of the first part of the study are then discussed covering the prevalence of prenatal depression and the nature of its association with life events in the previous year, perceived and current social support, autonomy and decision making, IPV, previous history of mental illness, mental illness in family and socioeconomic and demographic factors. This discussion is done considering the relevant literature available globally, regionally and in Pakistan.

6.2 Summary of the Main Findings

The prevalence of depression in the population of pregnant women in rural Rawalpindi was 27%. Most of these women were in the age group of 23-30 years, had primary to secondary level education with 1-3 living children. Most of the women reported a good health status in the last month and had their last delivery at home and only few had a history of miscarriage, and experienced the death of an infant or five-year old. More than half of the women had plans to use contraceptives after the current pregnancy. Among the pregnant women, those who were depressed ~~had~~ were of an older age group with low educational levels and had more pregnancies. All these associations were significant.

As far as the family related factors are concerned, most lived in a joint family system, where grandmother lived in the same house. Husbands of the depressed women were mostly less educated and manual laborers. Few households had two or more girls

and less than 7-year old children which is a risk factor for maternal depression in some studies. As far as women's own work status was concerned, few were working and when they did, it was manual. They were mostly satisfied with the accommodation and sanitary conditions of the household and overall with their life currently and perceived they will be satisfied in next 4 years as well.

The economic condition of the participants shows that most belonged to the poor wealth quintile with their own, husband's and household income less than 12000 Pakistani rupees. Most of the husbands had an education level of secondary or higher secondary and were non-manual laborers. Overall women were empowered to use their husbands' income and had money for basic needs and food but most of the households were in debt. Economic factors related with prenatal depression were the husband's income, wealth quintile, money for basic needs and food and family in debt in bivariate analysis.

Overall more than half of the respondents reported death or serious illness in the family, livelihood and financial problems in the previous year. Prenatal depression was associated with exposure to five or more stressful events in the last year and a close response relationship was found with depression increasing with increasing stressful life events in the previous year.

Depressed pregnant women had less perceived support from someone significant, family and friends. In everyday life most of the depressed pregnant women had significantly less support in the household chores and care of children as compared to the non-depressed.

More of the depressed women were making decisions about their own health and major household purchases with other family members as compared to the non-depressed but were not allowed to go to market or to visit relatives on their own. They didn't even have much time for themselves.

Depressed women suffered from psychological, physical and sexual violence in life and the frequency of such events was also more for these women within the last 12 months. Mental illness was not prevalent in the families of the participants, if at all there was some it was common mental illnesses. Substance abuse was also very low in the sample.

In the multivariate analysis the risk factors which were independently associated with prenatal depression included, multiparty, living in a joint family, being moderately satisfied and dissatisfied with life and having more than 5 stressful life events in last one year. While perceived social support from family and living in a suitable accommodation were protective factors.

6.3 General Methodological Considerations

6.3.1 Study Design: Strengths and Limitations

This was a cross-sectional study, the argument for selecting cross-sectional study have been presented in detail in the methodology section. The prospective cohort design which is the strongest among the observational studies could not possibly be used for the current study, given the resources required and follow up period which might not be enough as the researcher had to meet the timelines of the submission of the thesis to the University. The other observational design is Case Control which requires cases and controls to be selected from a well-defined population. In the study setting it was not possible to look for cases that are being treated in health facilities as the facilities here were at the primary and secondary level where trained mental health specialists are not appointed. Also as the study population consisted of pregnant women, only 67% of rural women sought antenatal care from skilled birth attendants PDHS 2012-13(NIPS, 2012). If the sample was health facility-based then those women who did not come to health facilities would be missed and there would be an underestimation of the prevalence of prenatal depression. Hospital based studies could not be generalized to the population.

In a cross-sectional study, temporal relationship could not be established as the exposure and outcome information is assessed at the same time and it was not possible to say whether exposure caused the outcome or because of the outcome individual behavior change occurred. As an example, from this study we found that low perceived social support by pregnant women is related to prenatal depression. However, it was not possible to determine if low levels of social support caused prenatal depression or whether women who were experiencing depression perceived low levels of social support. Cross-sectional is one of the epidemiological study designs where causality cannot be established hence in this study we could not predict that prenatal depression is caused by the studied risk factors.

Nevertheless given the paucity of research on the topic in the given population even a cross-sectional design was very useful to generate preliminary information about the prevalence of prenatal depression and its association with dietary intake and other risk factors.

6.3.2 Study Population: Strength and Limitations

The study population included all women in their second and third pregnancy trimester (4-8 months of pregnancy), over a period of one year living in the 40 clusters selected through randomization and were on the register of their respective LHWs in the study area. It was therefore a population based study showing the true prevalence of prenatal depression in the population. According to PDHS 2012-13 only 67% of rural women receive antenatal care from skilled health providers like doctors, Lady Health Visitors, midwives and nurses. If it would have been a hospital based sample, the women not seeking care from skilled attendants, in the health facilities, would have been missed. Another strength of the study is that the data collection team was allowed to visit the participants in their own homes; this being in accordance with the cultural norms which resulted in a higher response rate (procedure for data collection explained in methods section).

As discussed in the methodology section, the study area was selected due to some methodological and logistic reasons. The study site was not as remote as many other rural areas of Pakistan. It was close to and linked with road networks to major cities and towns. Therefore, the access to tertiary health care facilities and educational institutions was easier. The proportion of uneducated women was less as compared to the other rural areas of Pakistan. However, the highest level of education was primary or secondary (39%) as compared to 23% at the national level (NIPS, 2012).

Socioeconomic status of the families was calculated using wealth quintiles through Principal Component Analysis (PCA) as explained in the methodology section**.** It is a statistical procedure used in demographic and health surveys and has no subjective assessment.

One of the limitations of the study is that its sample was selected from the list of pregnant women registered by LHWs; therefore, in this sample those women who lived in areas not covered by LHWs were missed out. Another limitation is the lack of follow up of the study population into natal and post-natal period to determine the

neonatal outcomes and possible status of post-natal depression. Follow ups could not be done due to the financial and logistic constraints and can be a potential area for future research.

6.3.3 Study Tools: Strengths and Limitations

It is important to discuss the tools used for measuring different variables in the study as any inappropriate or invalid and unreliable tools would have rendered misleading results. The questionnaire used for maternal, family and economic factors captured the independent variables as well as the outcome variable (prenatal depression) at the same point in time.

6.3.4 PHQ 9

The instrument to measure prenatal depression (PHQ 9), is a self- administered tool, however, it had to be read out to the study participants due to their low literacy levels; more than half were either uneducated or had up to primary or middle level education.

The use of a short screening questionnaire like PHQ9 has become quite popular in research and practice, especially in low and middle income countries over the past decade. It has been translated and used in Pakistan as discussed in the methodology section. We used a cut off score of $\geq$10 which is the most accurate value for detection of depression (Manea et al., 2012). It has been validated in the West (Kroenke and Spitzer, 2002a) and has also been validated in India at the primary care level (Patel et al., 2008). It has been concluded by Manea et al., in a meta-analysis, that the optimum cut off point which yields best balance between sensitivity and PPV depends on the research settings; and it is recommended to have a higher cut off in resource limited settings (Manea et al., 2012).

The study population comprised of pregnant women and PHQ 9 included questions regarding symptoms such as loss of appetite, lack of sleep, tiredness or fatigue, which is also common in pregnancy. Therefore, it may have caused more false positives. But we kept a higher PHQ score as cut off point as compared to cut off score of $\geq$ 6 in the validation study of the Urdu translated version of PHQ 9 in Pakistan (Gholizadeh et al., 2017). In addition, in the context of South Asia, researchers have mentioned that common mental disorders are expressed by somatic symptoms; hence this aspect is taken care of by using appropriate instruments (Muñoz et al., 2005).

6.3.5 MSPSS

"Multidimensional scale of perceived social support" has been discussed in detail in the methodology section. It has been translated, validated and used in Pakistan and among the Pakistani population abroad (Akhtar et al., 2010, Jibeen and Khalid, 2010, Tonsing et al., 2012, Qadir et al., 2013). As discussed previously, it is a self-rating tool; however, due to low literacy levels of most of the participants, it was read to them by the data collectors.

We also checked for the correlation between various subscales and it was found that *significant others* and *Family* had high correlation(r= 0.669) whereas MSPSS family and *friends* were less correlated (r=0.329). *MSPSS others* and *friends* had low correlation (r=0.298). In order to avoid collinearity *MSPSS others* was not included in the final analysis. This is in line with the findings of Tonsing and colleagues (Tonsing et al., 2012) from a study among Pakistanis living in Hong Kong where the family and significant others' subscales were merged as they were collinear into family subscale.

The behavior of this tool is different in different cultures. In the Pakistani context Akhtar et al have provided several explanations (Akhtar et al., 2010). Our study site, Kallar Syedan, is rural and most families (63%) have a joint family structure with intermarriages occurring within families. Husbands were also working away from home for the whole day. Hence women got support from family members, like mothers or sisters-in-law. A significant other in this culture is conceptualized as the husband as it is not possible that anyone from outside the immediate family supports married women. These two subscales were therefore highly correlated.

Response Bias might have been introduced due to the women's low literacy levels. The Likert type scale was read to the participants and some suggestibility might have been introduced.

In case of family subscale, more than half of the women disagreed about support from friends, as married women rarely have any friends of their own and in the cultural context they stay in the house and mostly intermingle with the family members.

6.3.6 Life Events Checklist

As discussed in the methodology section, the life events checklist is developed from life events and difficulty schedule (LEDS) used in Pakistan. The original tool (LEDS) is an in-depth interview to assess stressful life events in the previous one year

with a number of probes and takes about an hour to finish. Whereas the checklist used in previous studies in Pakistan has a 'yes' or 'no' format. Checklists are criticized because of a lack of depth (Husain et al., 2012). In this study, due to the low levels of education among the participants and several other tools being applied at the same time it would have been highly uncomfortable to use the gold standard tool for one hour. Therefore, the life events checklist, developed by (Rahman et al., 2003c) from Urdu-translated and validated LEDS by (Husain et al., 2000) is considered to be a sufficient tool for the present study but at the cost of greater reliability and validity. Moreover, tools which captured stressful life events in last 12 months might have introduced recall bias.

6.4 Measures to Reduce Bias in the Study

Bias is a systematic error which is introduced at the time of selection of study participants' data collection or data analysis and can lead to distortion of result findings (Rothman et al., 2008). Biases are broadly divided into selection and information bias.

6.4.1 Selection Bias

Selection bias occurs if the study population is selected based on the characteristics to be compared. In the current study selection bias might have been introduced if the pregnant women were selected based on their mental status or other socio demographic or economic factors. An attempt was made to minimize selection bias in this study by approaching each pregnant woman registered with LHWs of the area irrespective of her mental status and other socio demographic factors. Moreover, the data collection team was unaware about how the prenatal depression status (outcome) will be assigned to the women from the PHQ scoring method. However, those pregnant women who were not registered with LHWs had a chance of being missed which might have resulted in selection bias.

6.4.2 Information Bias

As the information about the exposure and outcome is collected at the same time, it is useful to adopt standardized instruments and objective measures to reduce information bias. Sometimes even if objective measures are used, the respondents give information which is socially accepted, particularly if the information is related to some taboos (Yu and Tse, 2012) Bias can also occur if the interviewer is aware of exposure or outcome status of the respondent.

Various types of information bias can occur in a study:

a. Interviewer's Bias

This type of bias may occur if information is collected by the interviewer. As in this study, if the interviewers had known about the hypothesis of the study and that the respondent has prenatal depression, they would have been prompted to ask more about stressful life events in past year, perceived social support, IPV and other exposures. However, in the current study, the interviewers were not aware of study hypothesis and PHQ9 cut off scores for depression.

Prior to data collection, the student researcher conducted intense training sessions of the data collection team on all the study tools through, discussion, role playing and pilot testing in the field. Pilot tests results were analyzed and any misunderstandings were clarified in order to minimize interviewer's bias.

b. Recall Bias

Recall bias occurs when past events are remembered and reported differently by exposed and non-exposed participants (Rothman, 2012).

Recall bias is discussed above along with the instruments where there was a possibility for its occurrence.

There is often some degree of misclassification of exposure and outcome which is difficult to be ruled out. It is random (non-differential) if the groups have similar misclassification and differential if the groups have similar misclassification. Random or non-differential misclassification underestimates the true estimation between exposure and outcome variables while the other may either over or underestimate the true association (Last, 2007). All measures were standard for the participants and the data collectors didn't know the assignment of outcome. Thus, a (non-differential) misclassification is possible in this study which would have resulted in underestimation of association of prenatal depression with other variables.

6.4.3 Confounding

This should be considered in cross-sectional studies if associations between outcome and other factors are examined. In this study multivariate analysis was performed to control for confounding.

6.5 Discussion of the Main Findings

6.5.1 Prevalence of Prenatal Depression

The objective of the first part of the study was to determine the prevalence of prenatal depression in women living in Tehsil Kallar Syedan, District Rawalpindi, Pakistan. Prenatal Depression was assessed using PHQ-9 questionnaire. This is a self-reporting questionnaire, consisting of nine questions, which includes DSM-IV depression diagnostic criteria. Although "Edinburgh Postnatal Depression Scale" (EPDS) is a tool specifically used for perinatal depression (Hewitt et al., 2010), both PHQ-9 and EPDS were found to be consistent (Yawn et al., 2009, Zhong et al., 2014).The PHQ score of ten or more was used to define prenatal depression. Using this definition, the prevalence of depression in the study population of pregnant women in second and third trimester was estimated to be around 27%, which is almost two times more than what is observed internationally (Maselko, 2017, Shah et al., 2011). A community based study in rural Gilgit, carried out by Shah et al in 2011, used EPDS to compare the prevalence of prenatal depression among women belonging to different cultures, found prevalence rate of prenatal depression as 48.4% among Pakistani women; however, the high prevalence of prenatal depression might be attributed to a small sample size, remoteness of the geographical area and use of EPDS with a cutoff value of >13. Similarly, a study carried out by Humayun et al, also used EPDS but with a cut off value of >10 and found the prenatal prevalence to be 65% among the study population, which is quite high in comparison to various other studies using EPDS with a cut off value of > 12 (Shah et al., 2011, Husain et al., 2011, Imran and Haider, 2010).

The overall prevalence of prenatal depression in Pakistan ranges from 11.5% to 75% (Humayun et al., 2013, Ali et al., 2012, Zahidie et al., 2011, Husain et al., 2011, Imran and Haider, 2010, Karmaliani et al., 2009, Karmaliani et al., 2007, Hamirani et al., 2006). As discussed earlier, prevalence rates may vary with the type of assessment tool used (Fisher et al., 2012). While using the screening instruments, there can be further variations in rates, depending on the cut-off scores used to define the problem. For example, Roomruangwong et al, conducted a systematic review of sixteen studies in 2011, assessing the prevalence of prenatal depression by using BDI which is another type of self-reporting questionnaire and observed that prevalence of prenatal depression varied from 8.7% in Hong Kong (using BDI score 15) to 45.5% in Iran (using BDI score > 10); lowering the cutoff score resulted in increased percentage of prenatal

depression. When the assessment tool is a self-reporting questionnaire, the prevalence of prenatal depression is found to be high as compared to when diagnostic interviews are conducted (Steel et al, 2009). However, similarities are observed between the present study and a study carried out at Kahuta in 2003, by Rahman et al, in terms of it being community based in demographically similar settings, however, they had used "Schedules for Clinical Assessment in Neuropsychiatry" (SCAN), as an assessment tool which is a semi-structured clinical interview used by trained clinicians to assess and diagnose psychiatric disorders among adults. The prevalence of prenatal depression was found to be 25% which is quite close to our result indicating that PHQ-9, although a self-reporting tool, is at has the ability to diagnose depressive symptoms comparable with SCAN and valid enough to be used for prenatal depression assessment.

6.5.2 Stressful Life Events in Previous Year

Stressful life events may vary from mild to severe, depending on how the event is perceived and how well pregnant women can cope with it. In the present study, the association between prenatal depression and a total of ten stressful life events, occurring in the last one year, were examined by using bivariate analysis, and except "death/suicide or serious illness in a close relative" the rest all were found to be significant. These included, , "Illness/accidents leading to hospitalization" "livelihood and financial problems", "problems with residence and change in social status", "troubled relations with any close relatives/friends", "troubled marital relations", "worries about children's health/education" and "rows/quarrels amongst family members", "Similar results were obtained in a rural sub district of Rawalpindi by Rahman and colleagues (Rahman et al., 2003a). Stressful life events in the previous one year that were associated with depression during third trimester of pregnancy in their study were "unemployment of the earning member financial difficulties", "housing problems", "relationship issues within the extended family and serious marital problems". In the current study additionally "worries about children's health/education", "Illness/accidents leading to hospitalization" were also significantly associated. The reason for respondents being stressed on these issues may be related to population growth, low investment of government on health and education over the years between these two studies.

In this study, on multivariate analysis, like in many previous studies (Biaggi et al., 2016, Robinson et al., 2015, Melville et al., 2010, Leigh and Milgrom, 2008), an

association between stressful life events and prenatal depression was observed. Keeping in mind that pregnancy itself is a time of increased stress (Giallo et al., 2015), this study observed that women who had more than five stressful life events in the last one year were three times more depressed as compared to those who had less than two events ($P<0.001$); this being in concordance with the previously established fact that if a pregnant woman is exposed to stressful events in the year before pregnancy, it can make her more vulnerable to prenatal depression (Biaggi et al., 2016, Smith et al., 2011). A study with British Pakistani women in third trimester of pregnancy found depressed women had more non-health related events like financial, housing and marital problems (Husain et al., 2012). In my study, in addition to these, health related problems of relatives and children as well concerns about the children's education were also significant. This difference may be due to difference in study settings. My study was also conducted in rural and community settings as compared to urban and hospital settings in the British-Pakistani study. Secondly the health and educational facilities to the population also differ in the two countries.

6.5.3 Perceived and Current Social Support

"Multidimensional Scale of Perceived Social Support" has been used to assess the perceived and current social support of study population. MSPSS responses were merged into three categories as "Agree", "Disagree" and "Neither agree nor disagree". Pregnant women with prenatal depression had significantly fewer scores on total perceived social support (35.31± 15.99) as compared to those who did not have depression (48.88±11.07). Depressed women perceived less social support on the three subscales of significant others, family and friends. Our results were substantiated by another study carried out by Robertson et al, identifying the reason of such findings being the difficulty in evaluating the problem in an objective manner, as depressed women tend to feel less supported by people around them (Robertson et al., 2004). The absence of perceived social support has been identified as a risk factor for depression during pregnancy by some other studies in Nigeria, Canada and Ethiopia as well (Adewuya et al., 2007, Bayrampour et al., 2015, Dibaba et al., 2013). Studies carried out in Karachi, Pakistan also observed that the presence or absence of social support could forecast the occurrence of prenatal depression (Kazi et al., 2006, Farid et al., 2008).

In the present study, on multiple logistic regressions, perceived support from "family" subscale was found to be independently associated with prenatal depression and it had a negative association; indicating that an increase in support by "family" had a protective role against prenatal depression. Women who were supported by their family had less chance of getting depressed than those who had no support. Contrary to our findings, Husain et al, while conducting a study on British-Pakistani women, found significantly low mean scores on all three subscales, however, none of those subscales were independent predictors (Husain et al., 2012).

This difference from the current study may be due to different family structures in rural settings where the family structure is mostly "joint" or "extended" and family support is very important. Whereas the study by Hussain et al., the context of social support may be different in British-Pakistani women and no significant association was observed.

Maternal social support index assesses qualitative and quantitative aspects of a mother's social support (MSSI). It was found to be inversely correlated with the Center for Epidemiologic Studies Depression Scale (Pascoe et al., 1988). In this study in bivariate analysis MSSI categories were not significant. However in the multivariate model the P value for MSSI is <0.05 but the Odds ratio is too close to 1 showing almost no association.

6.5.4 Intimate Partner Violence

The prevalence of "Intimate Partner Violence" (IPV) was calculated on the basis of "yes" to any single question related to psychological, sexual and physical abuse. In the present study, the overall prevalence of psychological and sexual IPV was found to be 38% each, while prevalence of physical IPV was at 26%, whereas, in a study conducted in Japan, the prevalence of verbal violence was 11% and physical violence was less than 2% (Miura and Fujiwara, 2017). In a study conducted in Sweden, the most common form of violence was controlling behavior (25%) followed by physical (7.5%) and sexual (2.5%) in the past twelve months (Lövestad et al., 2017). The difference in the prevalence could be attributed to both countries being developed and the Swedish study was on non-pregnant women.

In Maharashtra, India, 35.9% of the study population reported physical abuse by their husbands (Reed et al., 2016) which is similar to our study. In a cross-sectional

survey carried out by Rubeena et al, in Lahore and Sialkot, Pakistan, the prevalence of psychological IPV was 75.9%. The observed difference can be attributed to the fact that these studies were conducted in different settings; our study is community-based and that conducted by Rubeena et al was hospital-based. Overall, we were able to identify on bivariate analysis that exposure to all the three forms of violence and frequency of such exposures (>6 times) can result in increased number of depressed women (P<0.01). IPV psychosocial was found significantly associated with, prenatal depression (OR 1.5 CI 1.12- 2.52 P <0.05) .Whereas in Japanese study both verbal and physical abuse during pregnancy were associated with post-partum depression (PPD) OR 4.85(CI 2.2- 10.5) and 7.05(CI 2.7-17.9) respectively. In the Swedish study controlling behavior, significantly associated with depression OR 2.43(CI 1.5 – 3.9), physical and sexual violence were also significantly associated and had higher odds of depression 3.06 (CI 1.50- 6.24 and 4.67 (CI 1.35-16.48). Studies have shown that controlling behavior/verbal abuse and physical violence are greatly overlapped (Pico-Alfonso et al., 2006) In the Pakistani study (Zakar et al., 2013) found that the odds of psychological violence was 3.67 (CI 3.67-7.93) which is much higher than in my study . This difference may be due to the hospital setting of the study, non-pregnant participants in the study and use of different measures for assessing depression and IPV.

6.5.5 Life Satisfaction in the Next 4 years

While exploring the level of satisfaction at present and in next four years, initially a five point scale was used which was eventually reduced to three categories: “satisfied”, “moderately satisfied” and “not satisfied”. Generally, it is believed and confirmed by some studies, that women who are satisfied in their lives are protected from depression (Abujilban et al., 2014). Keeping the “satisfied” group as reference, we found on the regression analysis, that women who were “moderately satisfied” had 2.4 times and those who were “not satisfied” had 6.9 times odds of having prenatal depression. Similar results were seen in a study among pregnant Jordanian women where high rates (57%) of antenatal depression was present, and in these women depression scores were strongly negatively correlated with satisfaction with life (r = – .50). This means that these women were not satisfied with life and the lack of satisfaction was affecting their mental health status.

Aasheim et al. in their study found life satisfaction was also associated with age “as the age increases, pregnant women report less satisfaction in life”(Aasheim et al.,

2014). This is not true for this study as most of the participants are less than 30 years of age.

6.5.6 Number of Pregnancies

The increase in number of pregnancies from 4-6, increased the odds of having prenatal depression by 2.3 times and this association was found to be significant ($P<0.01$). Few studies have shown association between number of pregnancies and depression but in postnatal period. Depression was associated with lower parity in Brazilian pregnant women in postnatal period. In a study by Ji et al, no difference was observed in depression of pre and post-natal period based on parity (Ji et al., 2011). In a cohort of Pakistani women in Norway, higher parity was associated with postnatal depression (Shaikh et al., 2011). It has been proved that prenatal depression is the precursor of postnatal depression (Rahman et al., 2003a), therefore higher parity is found a risk factor in both pre and post- natal periods in Pakistani women whether in a rural setting or living abroad.

6.5.7 Family Structure

It was observed that women living in joint family structure had 1.9 times increased odds of prenatal depression and it was found to be significant on logistic regression analysis ($P<0.05$). However, this finding was not substantiated by the study carried out by Rahman et all where they identified joint family as a protective factor for depression (Rahman et al., 2003a). This may be due to the change in cultural and environmental situation over the years. Women prefer to live in a nuclear family with their own children and husband and do not want to take the extra responsibilities of other family members.

6.6 Factors which were not significant

6.6.1 Maternal Factors

Majority of the depressed women in our study population belonged to the age group 23-30 years, a finding which is not substantiated by some previous studies where young maternal age was found to be associated with prenatal depression (Leigh and Milgrom, 2008, Rich-Edwards et al., 2006, Stewart, 2011); we were also unable to find a significant association for age on logistic regression analysis. Although bivariate analysis showed significant association with maternal education, their “health status”, “place of delivery”, and “number of living children” and most of the measured

maternal/obstetric factors were not significant on multivariate logistic regression analysis except number of pregnancies. Although we did not find an association between mother's education and prenatal depression, a systematic review carried out by Fisher et al, in low and middle income countries, observed that higher levels of education protect against prenatal depression (Fisher et al., 2012). We can explain it by the fact that our study population comprised of mostly uneducated or educated only up to primary/middle level women (56%).

6.6.2 Socioeconomic Factors

The socioeconomic factors found significant on bivariate analysis in this study were, "women occupation", "husband's income", "women empowerment status", "money for basic needs", "money for food" and "family in debt", however, none of them were found significant on logistic regression analysis. Nevertheless, a strong relationship has been observed between lower social class and depression (Osler et al., 2015, Lund et al., 2010, Lund, 2012). In our study, financial empowerment, husband being a manual laborer and being uneducated was associated with prenatal depression in bivariate analysis, in contrast to a study carried out in Karachi Pakistan (Husain et al., 2011) which observed no association between husband's employment or level of education. However, in Rawalpindi (Rahman et al., 2003b) observed an association between husband's employment or level of education and women empowerment with prenatal depression.

Wealth index was found highly significant in bivariate analysis, but not in multivariate analysis in this study which is consistent with findings of in Rawalpindi study (Rahman et al., 2003a) as both studies are conducted on similar populations of rural areas and in both most of the population belonged to the poor quintile.

6.6.3 Autonomy and Decision-making

Few women were employed in this sample (9.2%) as compared to (overall 29%, out of which 30% were urban and 19% rural) in the National level (PDHS12-13) (NIPS, 2012). Fewer numbers of employments as compared to that of PDHS may be attributed to the fact that all women of the present study were pregnant whereas PDHS took into account women of reproductive age (15-49) regardless of their pregnancy status. Most women in present study were manual laborers and did not have control over their husband's income. They could decide about their own health care, and going out and

having time for themselves. Most of the decisions were made by the husband or by other members of household. This is consistent with findings from PDHS12-13 (NIPS, 2012). Women are most likely to have the final or joint say on decisions regarding their own health care (52%) and visits to her family or relatives (50%), while they are less likely to participate in decisions about major household purchases (47%). However, in national level survey women were not pregnant and were not screened for depression. In the current study there is no significant difference between the depressed and non-depressed with regards to autonomy and decision making.

6.7 Conclusion

This study was one of the few epidemiological studies to ascertain the prevalence of psychological stress during pregnancy in a rural area of Rawalpindi. The study shows that over a quarter of all pregnant women in second or third trimester show evidence of depressive symptoms. Low educational status of women and living in a joint family system were risk factors for prenatal depression.

There were a higher number of stressful events in the previous year, and exposure to more than 3 or more such events was independently associated with prenatal depression. Women who thought they would be less satisfied or dissatisfied in future were also more depressed. There was also an association of prenatal depression with intimate partner violence, which is a serious issue.

Family support, both perceived by the women, and in the form of qualitative and quantitative support in daily household chores and raising kids were found protective. Similarly living in a household which has suitable accommodation and good sanitation conditions was also found as protective factor. As seen in the results of these study women have low levels of education, and suggested in earlier studies low educational level of women results in low awareness regarding mental health issues (Rahman et al., 1998). Attention is needed to develop cost-effective intervention strategies. Those families that are in transition from a more traditional way of life to the one which is influenced by recent socio-demographic and economic changes are more vulnerable.

There is a need to understand these cultural and socioeconomic changes and issues that lead to depression in women. This understanding may help health care

professionals and community health workers to more easily diagnose depression in these women, and provide appropriate support and treatment.

There is also a need to examine how depression and the associated factors in turn affect the other biological, cultural and economic consequences including maternal diet.

The next chapter will consider the association of prenatal depression with maternal dietary practices.

Section II (Chapter 7 – 13)

CHAPTER 7

DIETARY INTAKE DURING PREGNANCY

7.1 Introduction

The objective of this literature review is to examine the role of diet during pregnancy, dietary recommendations and factors affecting dietary intake during pregnancy.

The prenatal period is a time of increased vulnerability for the mother. Poor dietary habits have the potential to affect the well-being of both mother and the infant (Verbeke and De Bourdeaudhuij, 2007). Although several studies have demonstrated an association between poor maternal nutrition and its adverse effects on the fetus (Prado and Dewey, 2014, Edwards et al., 2001, Aizer and Currie, 2014, Hoet and Hanson, 1999, Langley-Evans, 2015, Osrin and Anthony, 2000, Wu et al., 2004, King, 2003, Tarry-Adkins et al., 2013, Brenseke et al., 2013, Imdad and Bhutta, 2012a) The effects of poor diet on the mother have not been studied extensively.

7.2 Importance of Diet during Pregnancy

Pregnancy is a time when many physiological changes take place in the mother in order to support the growing fetus. A balanced intake of macronutrients and micronutrients is essential for a healthy pregnancy (Avena, 2015). Lack of proportion in nutrition may result in adverse pregnancy outcomes (Feodor Nilsson et al., 2014, Shaw et al., 2014, Ramakrishnan et al., 2012, Mark et al., 1990, Obstetricians and Gynecologists, 2013). Therefore, it is very important to assess and monitor the nutritional status of a mother in order to give timely advice and make necessary interventions if required (Bhutta et al., 2013).

7.3 Important Food Groups for Both Mother and Fetus

It is believed that a mother's diet during pregnancy can have a significant impact on the outcomes of pregnancy and initial development of the baby (Cox and Phelan, 2008, Miller, 2011). Maternal nutritional status is an important variable of the outcomes of pregnancy (Nucci et al., 2001, Thangaratinam et al., 2012). The nutritional needs of a mother change during various phases (or trimesters) of pregnancy, after birth and during lactation. all of these phases lead to changes in the mother's tissues and dietary

metabolism (Giddens et al., 2000). According to Barker's hypothesis, "the fetal environment causes epigenetic modifications which influence gene expression and ultimately influence development of disease in children and adults" (Barker and Thornburg, 2013a). Previously, it was reckoned that the fetus acts like a scrounger inside the womb and receives its nourishment from the mother. However, recent studies have found that when there is an inadequate supply of maternal nutrition, the intricate balance between maternal and fetal needs is deranged and competition begins (King, 2003). At conception, the maternal nutritional status determines the distribution and partition of nutrients between the mother and the fetus. In the state of severe deficiencies, preference is given to maternal nutrition (Lowensohn et al., 2016, King, 2003). In pregnancy, the diet in the first trimester is important as the fetus is going through the organ development and differentiation phase, while the other two trimesters in pregnancy are crucial for the overall growth of the baby and its brain development (Rifas-Shiman et al., 2006, Aikat et al., 2016). Poor nutrition results in multiple micronutrient deficiencies and some of these nutrients warrant more attention due to their adverse effects on pregnancy outcomes, for example, folic acid, Vitamin C, E, D, and iodine (Allen, 2005, Bestwick et al., 2014, Roberts et al., 2010, Erkkola et al., 2009, Patrick and Ames, 2014, Stagnaro-Green et al., 2011, Aikat et al., 2016). Although the optimal mode for obtaining sufficient micronutrient intake is a balanced diet, supplements may also be required in certain cases (Black et al., 2008, Bhutta et al., 2013).

It is quite challenging to perform quality research during pregnancy (Robinson et al., 2014). This is due to many reasons. Firstly, there are several factors that can affect a mother's dietary intake, for example, anxiety, stress, smoking and intake of alcohol (Hobel et al., 2008). Secondly, determination of nutrients during pregnancy becomes complicated as the hormones produced alter the course of nutrient metabolism in the body(Bertram et al., 2001). Thirdly, nutritional needs are specific for each woman and vary greatly with variations in ethnicity and age, the diversity in the mother's reaction to pregnancy, moral and practical issues of experimenting with human pregnancy and lack of an appropriate animal model that can be applied to humans (Picciano, 2003). Dietary intake is considered to have an impact on the pregnancy outcome, it is therefore essential to identify the importance of various foods and their roles in the health of mother and the child (Mathews et al., 1999, Redmer et al., 2004, Wen et al., 2010,

Guelinckx et al., 2010, Prado and Dewey, 2014, Brown, 2016, Ramakrishnan et al., 2012, Haddow et al., 1999, Hoet and Hanson, 1999, Stagnaro-Green et al., 2011, Tanentsapf et al., 2011, Almond and Mazumder, 2011, Mistry and Williams, 2011, Tzanetakou et al., 2011, Imdad and Bhutta, 2012b, Blumfield et al., 2013, de Jersey et al., 2013, Aghajafari et al., 2013). Appropriate selection of nutrients is considered to be an important environmental factor affecting the outcome of pregnancy (Kaiser and Allen, 2008, Fieldhouse, 2013).

7.4 The Food Pyramid

Historically, the food pyramid has been developed as a nutrition education tool to help people understand the daily dietary requirements of various macro and micronutrients(Davis et al., 2001). It is based on consumer research carried out in the United States and provides guidelines for total diet rather than just the basic food groups (Russell et al., 1999). Moreover, it helps in a clear understanding of three important concepts of a healthy diet: variety, moderation and proportionality (Dixon et al., 2001). It provides a choice from a variety of foods so that an individual obtains the required nutrients and the suggested serving sizes can help in controlling the amount of calories, macro and micronutrients(Park et al., 2005). Pregnancy brings special nutritional needs to support the mother and her growing baby (Abedini and Gaini, 2011).

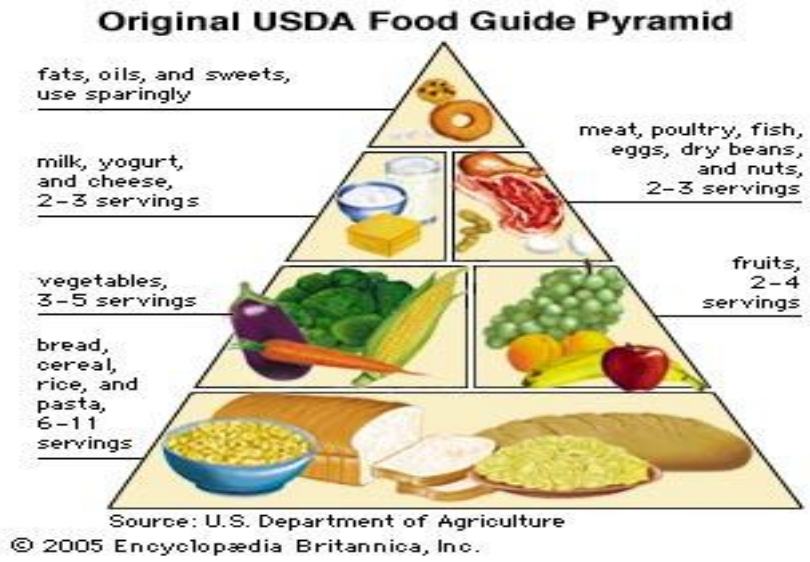

Figure 12: The Food Pyramid by USDA

Source:https://mailattachment.googleusercontent.com/attachment/u/0/?ui=2&ik=e2d38b0c

The food guide pyramid emphasizes foods from five major food groups showed in the three lower sections of the pyramid. Each of these groups provides some but not

all the nutrients required for a healthy body and mind. There are some food groups which are needed more than the others but each group has its own importance and cannot be a substitute for the other. The peak of the pyramid shows fats, oils and sweets and should be used sparingly. These are good in providing calories but are low in nutritional value. At the level below are two groups which are mainly derived from animals and are important sources of protein, iron, calcium and zinc. The level below this consists of food of plant origins, for example, vegetables and fruits. These should be consumed only as much to fulfill the daily requirements of vitamins, minerals and fiber. At the base of the pyramid are all foods from grains representing carbohydrates.

One of the tools used for nutritional education are Food-Based Dietary Guidelines (FBDGs) (Diethelm et al., 2012). FBDGs are educational tools which translate nutrient recommendations into simple text and pictures which make it easy for populations like Pakistan, where literacy rates are low, to understand. In Pakistan, the first step of assessing the nutrition status of the target population has already been done through the National Nutritional Survey, 2011. The food pyramid in Urdu was adopted keeping the target population in mind.

Figure 13: The Food Pyramid in Urdu

Source:https://mail-attachment.googleusercontent.com/attachment/u/0/?ui=2&ik=e2d38b

Food Group	Trimester 1	Trimester 2-3	One cup or one ounce equals:	Remember to...
	Eat this amount from each group daily.*			
Fruits 	2 cups	2 cups	1 cup fruit juice ½ cup dried fruit	*Focus on fruits*— Eat a variety of fruits.
Vegetables 	2½ cups	3 cups	1 cup raw or cooked veggies or juice 2 cups raw leafy veggies	*Vary your veggies*— Eat more dark-green and orange vegetables and cooked dry beans.
Grains 	6 ounces	8 ounces	1 slice bread 1 ounce ready-to-eat cereal ½ cup cooked pasta, rice or cereal	*Make half your grains whole*—Choose whole instead of refined grains.
Meat & Beans 	5½ ounces	6½ ounces	1 oz lean meat, poultry, or fish ¼ cup cooked dry beans ½ oz nuts or 1 egg 1 T peanut butter	*Go lean with protein*— Choose low-fat or lean meats and poultry.
Dairy 	3 cups	3 cups	1 cup milk 8 oz. yogurt 1½ oz cheese 2 oz. processed cheese	*Get your calcium-rich foods*—Go low-fat or fat-free when you choose milk, yogurt, and cheese.

* These amounts are for an average pregnant woman. You may need more or less than the average. Check with your health care provider to make sure you are gaining weight as you should.

Figure 14: Food pyramid guide for pregnant women

Source**:** *www.eatbetterearly.com/PDFS/**mypyramid**pregnancy.pdf* (USDA, May 2008)

7.5 Recommended Diet during Pregnancy

The importance of selecting the right food during pregnancy contributes positively towards a healthy mother and offspring, reducing the risk of birth abnormalities and complications (Arrish et al., 2014). There are numerous studies which indicate that diets of pregnant women are deficient in many important nutrients (Hurley et al., 2005, Sherwood et al., 2006, Pinto et al., 2009, Bodnar and Siega-Riz, 2002) therefore, dietary recommendations are essential during pregnancy. The incremental values and information received by investigating a complete diet in all three trimesters may relate to and help identify the outcomes of pregnancy (King, 2000, King, 2003, Anderson, 2001).

7.5.1 Recommended Macronutrients (Proteins, Carbohydrates and Fats)

During pregnancy the requirement for energy producing macronutrients (carbohydrates, fat and proteins) increases more than certain micronutrients such as Vitamin A, B and C which are found in several foods (Picciano, 2003). It is very important to recommend the correct proportion of macronutrients so that the expectant mother does not gain excessive weight (Rasmussen and Yaktine, 2009). If the mother gains excessive weight during pregnancy, the risk of adverse maternal and fetal

outcomes is increased (Ay et al., 2009, Flick et al., 2010, Davies et al., 2010, Durie et al., 2011, Ferraro et al., 2012). According to the national data for the United States from 2012 to 2013, appropriate gestational weight gain was less prevalent than excessive weight during pregnancy (Deputy et al., 2015). The mothers who gain insufficient or extra weight during pregnancy may be recommended to have nutritional counselling (Obstetricians and Gynecologists, 2013)

The appropriate intake of carbohydrates and proteins is fundamental during pregnancy as it affects the placenta and weight of the fetus (Osgerby et al., 2003). A combination of high carbohydrate intake and low dairy protein in the first trimester of pregnancy would result in suppressed placental growth, low infant birth weight and the risk of cardiovascular diseases in the infant (Godfrey et al., 1996, Maslova et al., 2014, Knudsen et al., 2008). A case study in India revealed that pregnant women belonging to a poor socioeconomic status have nutritional deficiencies and an inadequate dietary intake of proteins, calories and calcium (Malhotra and Passi, 2007). In South Asia, more than half of the women of reproductive age are malnourished and weigh less than 45 kilograms (Agha Khan University, 2011, Black et al., 2008). In a recent study conducted in low and middle income countries, including Pakistan, it was observed that both nutritional deficiencies and obesity are becoming a problem in women of child bearing age (Bhutta et al., 2013).

7.5.2 Proteins

Expectant mothers have increased requirements of proteins to support the placenta and fetus (Otten et al., 2006). Low protein stores in undernourished mothers may cause reduced accessibility of amino acids to the fetus resulting in fetal malnutrition (Shaikh et al., 2015). To fulfill this need, the Institute of Medicine in United States recommended 1.1 g/kg/day of protein for pregnant women as opposed to 0.8 g/kg/day recommended for non-pregnant adult women. Expectant mothers should be encouraged to consume the recommended amount of proteins on a daily basis as high amounts of protein may cause harm to the fetus (Ota et al., 2012, Blumfield and Collins, 2014). Protein supplements alone are not helpful in improving pregnancy outcomes (Ota et al., 2015a, Gillen-Goldstein et al., 2009).

During the course of the last two trimesters, additional protein is needed to replace the approximate 21g/day protein deposition in placental, fetal and maternal

tissues. Women of reproductive age are usually recommended to take an estimated 70g/ day of protein (Trumbo et al., 2002).

7.5.3 Carbohydrates

Carbohydrate requirements during pregnancy increase by 45 g/day as compared to non-pregnant women but refined carbohydrates should be avoided to maintain optimal gestational weight (Otten et al., 2006). Pre-pregnancy obesity is related to increased risk of adverse maternal and fetal outcomes (Ruager-Martin et al., 2010). Obesity in pregnancy is related to "exaggerated metabolic adaptation, endothelial dysfunction and increased risk of adverse pregnancy outcome" (Sarwer et al., 2006, King, 2006). However, a study carried out in Rotterdam, Netherlands, concluded that excessive weight gain during pregnancy does not have a significant impact on adverse pregnancy outcomes (Gaillard et al., 2013).It is estimated that the total energy intake during pregnancy is:

Total energy expenditure of a non-pregnant woman + median change in the total energy expenditure of 8 kcal/ gestational week + energy deposition during pregnancy of 180 kcal/ day (Ritchie and King, 2008).

This indicates that the total energy expenditure does not increase to a significant level in pregnancy and as far as a mother's weight gain is concerned, it is recommended to keep it minimal in the first trimester and an additional intake of energy of 340 to 450 kcal is recommended in the second and third trimesters respectively (Picciano, 2003).

7.5.4 Fats

An appropriate intake of fat is also essential during pregnancy and lactation as it influences the outcomes of pregnancy and the health, development and growth of the fetus. It was therefore concluded, by the consensus of experts, that the dietary fat intake for women during pregnancy and lactation would be the same as that of the general population; women who are expectant and lactating should try to achieve an average daily intake of 200 mg of DHA (Docosahexaenoic acid) (Kris-Etherton et al., 2009). Clinical trials have been conducted with daily DHA intake as high as 1g but no major adverse effects were discovered (Koletzko et al., 2007). In separate studies carried out by Denomme and Kulier, it was found that the intake of omega 3 fatty acids was not adequate by pregnant women (Denomme et al., 2005, Kulier et al., 1998). The pregnancy outcomes vary according to the type and quantity of fat intake by the mother

(Abu-Saad and Fraser, 2010). Trans fatty acids (TFA) are transported across the placenta in proportion to maternal intake which may adversely affect fetal growth by interfering with essential fatty acid metabolism (Innis, 2006).

Fish contains two important long chain polyunsaturated fatty acids (n-3 LCPUFA): docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA). These play an important role in fetal brain development and also provide modest protection against preterm birth (Makrides et al., 2011, Salvig and Lamont, 2011, Leventakou et al., 2014, Imhoff-Kunsch et al., 2012). However, intake of fish contaminated with methylmercury may have adverse fetal outcomes (Oken et al., 2008). A review of an interventional study carried out by Rees and colleagues indicates an association between low Omega-3 intake and depression (Rees et al., 2009). High levels of Omega-3 fatty acid are found in seafood and its higher consumption is positively associated with lower rates of maternal depression (Hibbeln, 2002). Omega-3 fatty acid levels were found to be considerably low in women who suffered from post-partum depression (De Vriese et al., 2003). An inverse correlation has been found between mood disorders and intake of Omega-3, indicating the beneficial role of Omega-3 in treatment and prevention of depression (Leung and Kaplan, 2009). However, overcoming the inadequate supply of Omega-3 PUFA in the diet of the people of western countries is a priority in order to formulate food and health related policies and also dietary recommendations for individuals and varied population groups. Studies conducted specifically on the association between Omega-3 intake and depression reported contrasting results suggest that the preventive role of omega-3 PUFA may depend also on other factors, which include diet quality and social environment. Tertiary prevention with Omega-3 PUFA supplement in depressed patients has reached greater effectiveness during the recent years, although definitive statements on their use in depression therapy cannot be asserted.

7.5.5 Recommended Micronutrients

The micronutrients that have been identified by United Nations (UN) to be prioritized in developing countries nutritional programs are Iodine, Vitamin A, Iron and more recently, Zinc. This micronutrients deficiency is estimated to affect mental and physical health and the consequent survival of more than two billion people across the globe. Women of childbearing age, especially pregnant or lactating women and children are most at the risk of micronutrient deficiency (Gibson and Ferguson, 2008).

A well-nourished mother may not require supplementation of multiple-micronutrients (MMN) to fulfill the increased requirements during pregnancy. In developed countries such as the United States, undernourished and high-risk mothers are advised to take multiple-micronutrient (MMN) supplements (Mark et al., 1990, Moos et al., 2008, Pediatrics, 2012). High-risk mothers are those having twin pregnancy, teenage pregnancy, heavy-smokers, complete vegetarians and those having malabsorption diseases. In Britain, folic acid supplementation is advised from the pre-pregnancy period till the end of the first trimester and Vitamin D for the entire duration of gestation and lactation in order to prevent neural tube defects (Cawley et al., 2016). In developing countries, multiple micronutrient deficiencies are common among women of childbearing age. Although micronutrients are required in very small amounts, their deficiency is exaggerated during pregnancy (Haider and Bhutta, 2015). Micronutrient supplements should contain key vitamins/minerals that are often not met by diet alone, for example iron, calcium, iodine, folic acid and Vitamin D. In addition to these important micronutrients, expectant mothers should have adequate intake of Vitamins A, E, C, B, and Zinc (Kumar and Bhatnagar, 2016).

Specific micronutrients are discussed in more detail below: -

Iron

Iron is essential for the development of both placenta and fetus. Iron deficiency is quite prevalent in expectant mothers in the United States (Mei et al., 2011). Similar findings were observed in a study conducted in Faisalabad, Pakistan (Anjum et al., 2015). To preserve maternal stores of iron and to prevent maternal anemia , the recommended iron intake during pregnancy is within the range of 9mg to 27mg per day and the total “iron cost of pregnancy is estimated at 1040mg, of which 200mg are retained by the mother when blood volume decreases after delivery and 840 mg are permanently lost” (Trumbo et al., 2001). The Center~~s~~ for Disease Control and Prevention (CDC) recommends 30mg of iron per day during the first trimester which may be reduced to 30mg two to three times a week in third trimester (Yip et al., 1998, Peña-Rosas et al., 2015). A study conducted by the American Society for Clinical Nutrition indicates that iron deficiency anemia in pregnancy is a risk factor for premature delivery and low birth weight and possibly for poor neonatal health (Allen, 2000). In a study carried out in India, it was revealed that severe anemia in the mother is associated with negative pregnancy outcomes in both mother and fetus (Chandrika,

2016). In Pakistan, 20.7% of urban and 28.3% of rural women of child bearing age were found to be anemic (Agha Khan University, 2011).

Calcium and Vitamin D

Low calcium and Vitamin D levels are responsible for poor health of mother and child, but it is yet to be firmly established whether low levels of calcium and Vitamin D are the causal factor or an indicator of poor health. Fetal skeletal development requires about 30 grams of calcium during pregnancy, primarily in the last trimester(Hacker et al., 2012).

The Recommended Dietary Allowance (RDA) for elemental calcium is 1000 mg per day in pregnant and lactating women 19 to 50 years of age (1300 mg for girls 14 to 18 years old) (Gillen-Goldstein et al., 2009). In a 2015 systematic review, calcium supplementation did not reduce the risk of spontaneous preterm birth or low birth weight (Buppasiri et al., 2015).

Vitamin D supplementation of 10 microgram (400 IU) / day in women who had vitamin D deficiency resulted in lower incidence of neonatal hypocalcaemia and tetany as well as maternal osteomalacia (Pérez-López et al., 2015, Sauberlich, 1999) and may reduce the risk of adverse pregnancy outcomes (De-Regil et al., 2016). Higher intakes (about 25 micrograms/ day) resulted in the postnatal increase in the weight and length of the infant (Sauberlich, 1999).

In a study carried out by Lansdowne and Provost, Vitamin D was shown to have a positive effect on mood (Berk et al., 2007). Low levels of Vitamin D are associated with depression (Anglin et al., 2013). In another study a hypothetical connection has been made between prenatal Vitamin D deficiency and mental disorders (Humble, 2010). Vitamin D is also an essential nutrient for pregnancy as its deficiency may lead to calcium disorders in both the fetus and the mother, for example, neonatal hypocalcaemia and tetany, maternal osteomalacia and infant Hypoplasia (Specker, 1994). The deficiency of Vitamin D and asthma are both common in the latitudes near the poles but its exact relationship with asthma is not known (Lange et al., 2009).

Vitamin D boosts the immune system and its deficiency increases the risk of autoimmune diseases and viral infections through loss of regulatory adaptive immune functions (Lucas et al., 2014). A study carried out in North-eastern United States concluded that a higher maternal consumption of Vitamin D in pregnancy will lead to

a mitigation of risk associated with recurrent wheeze (predictive index for occurrence of asthma) in the first three years of infancy (Camargo et al., 2007). Intake of Vitamin D is also necessary as its deficiency in pregnant women leads to small infants, gestational diabetes, macrosomia, hypertension and pre-eclampsia (Lewis et al., 2010, Hyppönen et al., 2014). Vitamin D deficiency is prevalent in South Asia and the Middle East (Mithal et al., 2009, Sachan et al., 2005, Kazemi et al., 2009). In a study carried out by Karim et al, in Karachi, Pakistan, it was observed that Vitamin D deficiency is high among pregnant women. Vitamin D levels of pregnant women were affected by exposure to sunlight and quality of diet (Karim et al., 2011). According to the 2010 IOM report, 600 international units of Vitamin D per day are recommended for all reproductive age women, including pregnant and lactating mothers (Sollis, 2015).

Folic Acid and Vitamin B12

Folic acid intake is also essential as its deficiency will lead to certain abnormal pregnancy outcomes which include low infant birth weight, spontaneous abortions, abruptio placentae and occurrence and recurrence of neural tube defects (Scholl and Johnson, 2000). The recommended intake of folic acid during pregnancy is 600 micrograms per day (Sauberlich, 1999). The United States Preventive Services Task Force recommends that women should take a supplement containing 0.4 to 0.8mg of folic acid one month before and for the first two to three months after conception to reduce their risk of having a child with a neural tube defect (Czeizel et al., 2013). Despite such recommendations, the percentage of pregnant women taking folic acid in the first trimester is low as compared to the second or third trimesters (Branum et al., 2013). A deficiency of folic acid is associated with depression and dementia (Reynolds, 2002). Low levels of Vitamin B12 in pregnancy have been associated with an increased risk of gestational diabetes mellitus (Krishnaveni et al., 2009). If the mother is deficient in B12 at the initiation of pregnancy then there is a higher risk of development of neural tube defects in the fetus and this may also cause preterm delivery (Molloy et al., 2008).

Zinc

Zinc is an important element for normal growth of the fetus and its significant deficiency has been associated with fetal growth retardation (Jameson, 1993, Beaver et al., 2017, Pathak and Kapil, 2004, Shen et al., 2015), dwarfism (Prasad, 2013) and pre-eclampsia (Beaver et al., 2017). Zinc deficiency has also been associated with multiple

problems during and after pregnancy and also with maternal depression (Karimi et al., 2012). However, a systematic review in 2015 concluded that zinc supplementation in zinc deficient mothers did not improve any pregnancy outcome (Ota et al., 2015b). In an older study conducted by the University of Alabama it was revealed that Zinc intake did not have a significant effect on birth weight and duration of gestation (Neggers et al., 1996). People living in South Asia and South East Asia are at greatest risk of zinc deficiency (Akhtar, 2016). Zinc deficiency is considered to be one of the major factors contributing to burden of disease in developing countries (Khalid et al., 2014).

Iodine

Another micronutrient that is essential during pregnancy is Iodine. Iodine Deficiency Disorders (IDDs) is affecting almost half of Pakistan's population (Di Cesare et al., 2015). Deficiency in maternal intake of iodine has potentially harmful effects on the fetus and is the cause of mental retardation of the fetus through the characterization of fetal hypothyroidism and cretinism. Therefore, iodine is essential for fetal brain development and maturation (Dunn and Delange, 2001, Yarrington and Pearce, 2011).The World Health Organization (WHO) recommends iodine intake of 250mcg for both pregnant and lactating women (Patrick, 2008).

Vitamin A

The placental exchange of Vitamin A between mother and fetus is significant (Dimenstein et al., 1996) and the recommended intake should increase by approximately 10% during pregnancy as deficiency of Vitamin A is associated with the intrauterine growth retardation (Verma et al., 2017).

7.6 Recommended Diet According to Trimester of Pregnancy

Nutritionists recommend a diet that is different for all three trimesters because nutritional demands of the mother and fetus change as the pregnancy advances. Diet in the 1st trimester is important for development and differentiation of various organs, whereas diet later in pregnancy is important for overall fetal growth and brain development (Mark et al., 1990).

7.6.1 First Trimester

The first trimester is critical because in this phase the baby is developing vital organs such as the heart, brain and lungs, therefore, the recommended diet includes foods rich in folates which facilitate the growth of the baby. Supplemental folic acid of approximately 400 mcg/ day is also needed along with foods rich in Vitamin A for development of organ systems and Vitamin B6 to counter morning sickness and nausea for the mother (Judd, 2014). In the first trimester of pregnancy, women typically do not need to increase their caloric intake.

7.6.2 Second and Third Trimesters

The second trimester is easier for the mother both from a dietary point of view and absence of nausea. The baby is growing in size and weight and the necessary diet includes Vitamin D and calcium for the proper bone and teeth formation of the baby. Omega-3 fatty acids are required for healthy development of the baby's brain and iron-rich foods are also needed for placenta growth, formation of red blood cells and increase in blood volume.

Pregnant women of normal weight need to increase their daily caloric intake by 340 and 450 additional kcal/day in the second and third trimesters respectively, for appropriate weight gain. Most pregnant women require between 2200 and 2900 kcal/day during the last two trimesters (Procter and Campbell, 2014). However, caloric requirements of pregnant women differ due to difference in age, BMI and level of physical activity (Mark et al., 1990, Widen and Siega-Riz, 2010)

The third trimester is the most challenging for a mother, both emotionally and physically, and requires an increased intake of Vitamin K that will assist in the clotting of blood at the time of delivery (Dahlbäck, 2000, Vitamin). On an average, the numbers of servings for each food group needed to meet per day caloric requirements of later trimesters are:

1. Fruits: 2 to 2.5 cup
2. Vegetables: 3 to 3.5 cups
3. Grains: 60to 10 oz
4. Proteins 6to 7 oz
5. Dairy: 3 cups (Procter and Campbell, 2014)

7.7 Factors Affecting Dietary Intake during Pregnancy

There are several factors that affect the dietary intake during pregnancy. Pregnancy is a phase where a change in dietary intake affects the health of both mother and the fetus (Monk et al., 2013). The variety of factors include race, psychosocial factors, environmental factors, earning capacity, lifestyle and cultural factors, age and weight of the mother and deficiency or excess of certain important nutrients(Hollis, 2005, Monk et al., 2013).

7.7.1 Maternal and Demographic Factors

Pregnant women who are less than thirty years of age, nulliparous and have completed high school have a higher "Diet Quality Index for Pregnancy" (DQI-P) score (Bodnar and Siega-Riz, 2002, Mathew et al., 2012b). Increased parity along with increased age during pregnancy is associated with anxiety and depressed mood in pregnancy leading to effected dietary intake especially micronutrients. The stressed pregnant women show lower intake of protein and folate along with higher intake of sugar and oils (Hurley et al., 2005). In United States, a study was carried out in Texas, where education levels were found to be the best predictor for folic acid supplementation during pregnancy followed by ethnicity/race and age (Canfield et al., 2006).

The most common problem related to women's nutrition in developing countries is malnutrition, specifically under nutrition, which increases maternal and child mortality along with overall disease burden. Statistics show that approximately 40% women in South East Asia region have low body mass index (Black et al., 2008, Walton and Allen, 2011, Merchant, 2014). According to the National Nutrition Survey of Pakistan, 2011, 13% of non-pregnant and 16% of pregnant women are undernourished(Di Cesare et al., 2015).

If a mother enters into pregnancy undernourished, adverse pregnancy health outcomes may result. For example, maternal short stature has been strongly correlated with cesarean sections instead of normal delivery due cephalo-pelvic disproportions. This is of concern as operative delivery is not only more expensive but may also not be available to all hence posing a greater risk to mother and baby (Ronsmans et al., 2006).

Demographic studies reveal that dietary intake is dependent on the type of population and geography (Resano-Mayor et al., 2016). For example, the intake of

Vitamin D is lower in the general population and even lower in pregnant women (Mithal et al., 2009) especially in countries with high altitudes, for example Canada and Norway (Moan et al., 2008). A research study compared the nutritional status and diet of pregnant Pakistani immigrants and pregnant Norwegian women living in Oslo and the results revealed that Pakistani women are more likely to develop a Vitamin D deficiency in pregnancy due to minimal exposure to sun, low dietary intake of Vitamin D and negligible use of Vitamin supplements (Brunvand et al., 1996). In a recent study conducted by Junaid et al, in Lahore, Pakistan, it was observed that Vitamin D deficiency is common among healthy women of child-bearing age. Illiteracy and decreased sun exposure were identified as important risk factors (Junaid et al., 2015). In Hazara District, Pakistan, where women are mostly purdah observing, Vitamin D deficiency was observed in remote deep valleys, which had less sunlight, causing cranio-pelvic disproportion among women. Consequently, this resulted in an increased need of cesarean sections (Herm et al., 2005) .

7.7.2 Socio-economic Factors

Two types of diet have been identified and assigned to the upper and lower socioeconomic groups respectively; one as nutrient-dense (which is rich in nutrients necessary for health) and the other as energy-dense (which is high in calories but low in nutritious value) (James et al., 1997).

Many epidemiological studies have linked obesity with lower socioeconomic-status, (Stunkard and Sorensen, 1993, Zhang and Wang, 2004, Dinsa et al., 2012, McLaren, 2007, Monteiro et al., 2004) whereas people from higher socioeconomic status consume nutrient rich diets which helps them to remain healthy and within their ideal body weight range (Drewnowski and Darmon, 2005).

In a survey carried out by the American Society of Nutrition, it was found that people belonging to a higher socio-economic status tend to consume high quality diets as compared to those who are in the lower socio-economic strata (Darmon and Drewnowski, 2008). In another study carried out in Norway, it was concluded that social class creates a barrier in consumption of healthy foods like vegetables and fish. This barrier is due the consumer's own expectations which then takes the form of their habits (Cockerham, 2005). Pregnant women with low income are at a higher risk for poor diet quality (Fowles et al., 2012). Therefore, nutritious food should be made more

affordable for the low income households (Kirkpatrick and Tarasuk, 2003). A study carried out by Kirkpatrick et al shows that pregnant women belonging to middle and upper socio economic status had insufficient intake of iron and magnesium from dietary sources (Turner et al., 2003). In the same study it was observed that total food expenditure among low-income households was less and they also bought fewer portions of fruits and vegetables as compared to higher-income households (Kirkpatrick and Tarasuk, 2003).

Political instability, natural disasters and poverty, resulting in decreased purchasing power, all lead to food insecurity which ultimately affects the nutritional status of both the mother and the fetus (Hussain and Routray, 2012). Statistics for the year 2008 show that 51% of the population in Pakistan was food insecure and consumed less than 2100kcal per day, the numbers being double in rural areas as compared to urban areas (Ahmad, 2009). Family income and partner's emotional support during pregnancy are associated with low dietary diversity (Hussain and Routray, 2012).

Low literacy levels (68.7% in rural and 36.3% in urban in 2011) lack of knowledge and awareness regarding prenatal and antenatal care as well as diet, lack of infrastructure and adequate health services and less gap between pregnancies with more parity are all factors that take a toll on the mother's health (Agha Khan University, 2011). In 2011, the Times magazine presented statistics with regards to purchasing power showing that 46% of a family's income in Pakistan is spent on food as compared to 35% in India and just 7% in US (Muhammad et al., 2011). The national nutrition survey of Pakistan in 2011 also confirms the above claims of lack of knowledge and awareness by showing that only 50% of rural women seek antenatal care once during their pregnancy and most women have little knowledge about micronutrient deficiencies and their consequences. Only 26.7% women consumed iron and folate and only 39% consumed calcium (Agha Khan University, 2011).

7.7.3 Cultural Factors

Cultural factors affect diet and are therefore considered to be an important variable for the outcome of pregnancy (Gutierrez, 1999, Fieldhouse, 2013). Irrespective of their knowledge about dietary intake, pregnant women tend to choose the traditional food recommended by their families (Fieldhouse, 2013, Gutierrez, 1999). A study was carried out in Detroit on low income recently immigrated pregnant

Latino women. It was found that social support provided by the family members promoted healthy lifestyles (Thornton et al., 2006).

7.7.4 Intimate Partner Violence

Intimate Partner Violence (IPV) has been identified as a risk factor for mental health problems during pregnancy (Ali et al., 2013) and a study by Bonomi et al found that victims of IPV are three to five times more vulnerable to suffer from social problems and depression (Bonomi et al., 2009). IPV can be sexual, physical or psychological and many sociodemographic factors have been recognized to be responsible for such kind of behavior for example, gender inequality, low earnings or jobless husband, low socioeconomic-status, low educational status, too many children and living in the same house with extended family (Ali et al., 2011). The occurrence of IPV especially during pregnancy was studied in nineteen countries by Karen et al where the lowest prevalence of IPV was found to be in Australia (2%) and highest (13.5%) in Uganda. Besides physical and psychosocial harm, nutritional status of the women is also affected by IPV and in order to investigate this aspect a study was carried out in India by Ackerson et al, which found that such women had lower body weights and lower levels of Hemoglobin (Ackerson and Subramanian, 2008). Intimate partner violence has been identified as a major public health problem in Pakistan (Ali et al., 2014) and a study conducted to assess the magnitude of IPV indicated that 44% of women experience lifetime marital physical abuse (Fikree et al., 2006). Cultural norms in Pakistan demand that violence against women should not be discussed openly (Rabbani et al., 2008b, Khan et al., 2010). As a consequence, women usually do not file any complaint against their partners. In a study carried out by Ali et al in Karachi, it was observed that married women face repeated violence especially in low and middle income population (Ali et al., 2011). A systematic review, carried out by Ali et al, observed that in Pakistan intimate partner violence was perpetrated by men and women were always the victims (Ali et al., 2015).

An association between intimate partner violence and body mass index (BMI) and diet and exercise was studied by Mathew et al in Atlanta, Georgia. There was no significant relationship between IPV and BMI although IPV victims endorsed less healthy dietary habits (Mathew et al., 2012b).

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7.7.5 Eating Disorders

Anorexia nervosa and bulimia nervosa are characterized by persistent disturbances in eating patterns that impair general health and psychosocial functioning (Association, 2013). Eating disorders are most often found in adolescent and young adult women; thus, they are often observed during pregnancy when weight and eating habits are closely monitored. Pregnant women with eating disorders appear to be more at risk for delivery by cesarean section and for postpartum depression (Franko et al., 2001). For some women with eating disorders, pregnancy is an opportunity for recovery, for other patients, pregnancy is a period of vulnerability for onset, persistence, or relapse of eating disorder symptoms (Mitchell-Gieleghem et al., 2002, Kouba et al., 2005).

Pregnant women with anorexia nervosa are three times more likely to eat a vegetarian diet, compared to pregnant women with no history of eating disorders (Micali et al., 2012b). Adverse pregnancy outcomes, antepartum hemorrhage, low birth weight, pre-eclampsia, preterm delivery and small/large for date babies are observed more often in patients with anorexia nervosa than women without anorexia nervosa (Eagles et al., 2012, Solmi et al., 2013, Ekeus et al., 2006, Micali et al., 2012a, Bulik et al., 2009).

7.7.6 Psychosocial Factors

A study shows that pregnant women with depressed mood, anxiety, stress, lack of social support, anger, fatigue have unhealthier macronutrients and less effective healthy micronutrients in 24 to 32 weeks of gestation (Uzogara, 2016). Psychosocial factors relate social conditions to mental health. While so many deep-rooted biological, geographical, cultural, socio-economic factors influence nutrition; little has been investigated about how these factors influence the psychosocial state of the mother during pregnancy and how that may also influence her dietary practices. A higher prevalence of depression has been reported during pregnancy and post-partum due to high levels of stress, anxiety, environmental factors and hormonal changes (Bloch et al., 2003).

Therefore, such stress inducing factors should be taken into account during diet counseling of pregnant women as they can directly influence the dietary intake during pregnancy (Hurley et al., 2005). According to a study conducted in the United States,

certain psychosocial characteristics like stress, anxiety, mood swings, depression and fatigue affect the eating habits of pregnant women (Leight et al., 2010). Depression was also identified by another study to be an important factor leading to poor maternal dietary intake (Clum et al., 2014). In Pakistan, studies related to maternal depression and the associated risk factor have been conducted but there is a scarcity of studies at population level exploring the association of prenatal depression and dietary intake of women.

From the review of literature there appears to be limited findings on the direct relationship between prenatal depression and dietary intake. Therefore, the objective of the next chapter, "Depression and Diet" would be to find the relationship, if any, between prenatal depression and maternal dietary intake.

7.8 Conceptual Framework

The conceptual framework, used for this study was adopted and modified from UNICEF's conceptual framework on the determinants of malnutrition (UNICEF, 1998). Maternal health is greatly influenced by her dietary practices and her psychological status (Pariante et al., 2014). The dietary intake of a depressed mother is inadequate affecting her morbidity as well as pregnancy outcomes (Barker et al., 2013).

Maternal depression is not only affected by demographic factors such as age, parity, gestation age and level of education, it is influenced by socio-economic, cultural and social support factors as well (Méjean et al., 2010).

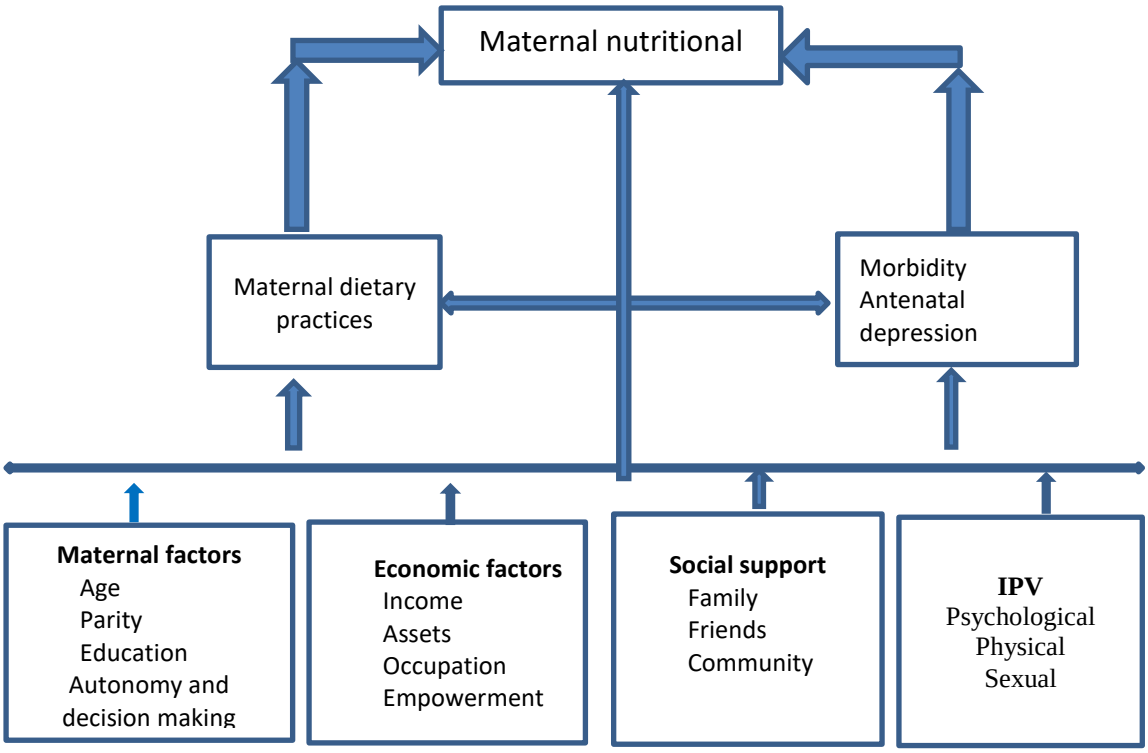

Figure 15: Factors affecting dietary intake practices (UNICEF, 1998)

7.9 Summary

In this chapter, the existing literature was reviewed regarding dietary requirements during pregnancy, problems associated with deficiencies of various macro and micronutrients and factors which could possibly affect diet of a pregnant woman. Many studies indicated that an imbalance of nutrition may result in adverse pregnancy outcomes (Feodor Nilsson, Andersen, Strandberg-Larsen, & Nybo Andersen, 2014; Mark et al., 1990; Obstetricians & Gynecologists, 2013; Ramakrishnan, Grant, Goldenberg, Zongrone, & Martorell, 2012; Shaw et al., 2014). The nutritional needs of a woman change during various phases of pregnancy and diet is considered to be an important environmental/modifiable factor affecting pregnancy outcomes (Giddens et al., 2000). Important food groups for both mother and the fetus were discussed using USDA approved food pyramid guides. Subsequently, macronutrients and micronutrients were also discussed in detail and recommendations were made according to the trimester of pregnancy. Finally, factors that affect nutritional intake of pregnant women were also studied in order to understand and figure out the relationship between maternal diet, supplement nutrition and health of the mother and fetus.

Pregnancy, being a major nutritional stressor, makes a woman more vulnerable to depression (Lindgren, 2001). Depressed women tend to have poor dietary intake (Saeed et al., 2016a), therefore, a need for further research was needed to determine the relationship between depression and diet among pregnant women. Much of the previous research work was focused on identifying specific nutrients responsible for depression, mainly among non-pregnant women. In the next chapter an attempt will be made to look for an association between prenatal depression and dietary practices.

CHAPTER 8

ASSOCIATION OF PRENATAL DEPRESSION AND DIET - SYSTEMATIC REVIEW

8.1 Abstract

This systematic review was conducted to explore the association of prenatal depression with diet considering whether depression in prenatal period affects the dietary intake of women. This link is hypothesized because mental health of women adversely affects the nutritional intake and has an impact on the developing fetus as well. Many databases like PubMed, CINAHL, EMBASE, Cochrane library and PsycInfo were used for relevant articles from year 2000- 2015. Peer-reviewed studies of analytical design in English language that evaluated the relationship of perinatal depression to dietary intake were included. We searched 1585 articles of which 14 met the inclusion criteria. These included 4 prospective cohorts, 2 longitudinal and 8 cross sectional studies representing 23629 participants in all studies combined. Studies were grouped depending on whether they are analyzing all nutrients, micronutrients, dietary patterns, dietary behavior or intake of oily fish into 5 groups.

The studies exploring the association of depression with dietary patterns found a protective association of " Health Conscious", "Healthy" and " Brazilian " diet patterns with prenatal depression. The group of studies analyzing all nutrients found that antenatal depression increased the risk of poor "Healthy Eating Index" and that depressed mothers are deficient in calcium, iron and folate. Prenatal and early postpartum eating attitudes and BMI were found as predictors of depressive symptoms in late post-partum period in a diet behavior study.

One of the limitations of this review is absence of meta-analysis which was not possible due to heterogeneity of the studies. Our review had all observational studies and none were RCTs, as such trials usually consist of short follow-up periods, small sample sizes, a single nutrient intervention being studied, and homogeneous samples that do not include pregnant women.

Studies included in the review had few methodological issues like variations in measurement of maternal depression and dietary intake, sample size, observational

design and other inconsistencies in findings; it was not possible to conclude that perinatal depression is associated with dietary intake. More holistic approaches to exposure and outcome measurement may therefore be promising approach in future epidemiological studies in this field.

Keywords: nutrition, diet, maternal depression, prenatal depression, association

8.2 Introduction

The perinatal period, defined as pregnancy and one year postpartum, represents a vulnerable time for women as they undergo physical, physiological, psychological and social changes(Clark et al., 2009) During this time women are at an increased risk of experiencing serious mental health problems that can impact the health and wellbeing of both mother and infant. In addition, depression during pregnancy and motherhood has a negative impact on mother–child interactions which plays an important role in infant cognitive and emotional development(BARKER and THORNBURG, 2013b).

The prevalence of prenatal depression ranges from 6.5 to 12.9% in various countries of the world with the general predominance of 7.4% during the first trimester, 12.8% in the second, and 12% in the third trimester (Bennett et al., 2004). In 2009, WHO estimated that by year 2020 depressive disorders will become the leading cause of global disease burden in women (Organization et al., 2009). In developing countries the overall prevalence of prenatal depression is quite high (Premji, 2014, Fisher et al., 2012). A study carried out in Bangladesh in 2011, observed that prevalence of antenatal depression in study population was 18% (Nasreen et al., 2011). However, in 2006, a study in Karachi, Pakistan reported a 34% prevalence of prenatal depression (Hamirani et al., 2006) and Rahman et al, in rural Pakistan found it to be 25% (Rahman et al., 2008). While comparing antenatal depression among Pakistani and Canadian women, Mahboob et al. found a higher prevalence of antenatal depression among Pakistani women (48%) than Canadian aboriginal (31%) and Caucasian (9%) women (Shah et al., 2011). In low-middle income countries (LMIC), where women are exposed to scarcity of resources, prenatal depression is found to be quite prevalent (Rwakarema et al., 2015). Poor maternal mental health is an increasing public health concern worldwide and particularly in (LMICs), where maternal depression is more common; as these women live in an environment of stress, anxiety, poverty and political

instability(Shidhaye et al., 2013). Hence, there is a need to identify those lifestyle risk factors which contribute to maternal depression and are modifiable. Among other factors like socio-economic deprivation, lack of social support, stressful life events & domestic violence, unhealthy and poor quality diet is also reported to be positively associated with increase prevalence of maternal depression (Trujillo et al., 2018).

Over the past decade, the relationship of mental illness and diet has gained attention of the researchers (Lai et al., 2013, Psaltopoulou et al., 2013). In case of depression during pregnancy, women tend to take unhealthy nutrition. In an Iranian study depressed women consumed less macronutrients except fat (Payab et al., 2012). Whole dietary intake levels of pregnant Korean women were found to be insufficient as compared to Recommended Nutrient Intake (R&I) with the exception of phosphorus (Won, 2011). Literature also shows that depressed pregnant women have more macronutrient intake as compared to micronutrients(Hurley et al., 2005).

Association between diet quality, diet patterns and depression is also being systematically reviewed. A positive association was found between unhealthy Western diets and the odds of depressive symptoms; however, this association was not significant (Lai et al., 2013).Whereas Jacka et al., have explored the association between diet quality, anxiety and stress. There is evidence to suggest that the mechanism underlying the association between diet quality and mental illness is not limited to depressive symptoms (Jacka et al., 2010).

Nutrition is essential for normal brain functioning, including the proper functioning of neurotransmitters which may be a key element of the connection between nutrition and depression. Research in women during pregnancy and postpartum has focused on the intake of individual micronutrients and vitamins (Bodnar and Wisner, 2005). Many studies have focused on causes and risk factors associated with perinatal depression (Lancaster et al., 2010a) but there is limited material available on prenatal depression and dietary practices.

There are various theories which try to explain the pathophysiology of depression, for example, a study by Laraia and colleagues, about bio-behavioral and social factors that shape nutrition, found that stress activates the hypothalamic-pituitary-adrenal axis. This may cause increased release of stress related hormones, shifting metabolism to favor storage of excess calories as central fat. This study also

observed that low-income individuals with money concerns ate unhealthy foods because of stress as compared to those with no money concerns (Laraia et al., 2017). Another theory is that of monoamine oxidase A, which states that high levels of this hormone may cause depression (Meyer et al., 2006). Omega-3 fatty acids, folate and the neurotransmitter precursor compounds, L-tryptophan and *S*-adenosyl methionine, found in vegetables, fruits, nuts, cereals, legumes and fish, have a protective role in preventing depressive disorders by acting as MAO-A inhibitors (Sánchez-Villegas et al., 2009). Therefore, nutritional status, particularly fatty acids, folate, and B12, have been shown to affect depression. Low omega-3 fatty acid status has been linked to an increased incidence of depression (Bourre, 2005).

In the past, most of the reviews were conducted on maternal depression, its dynamics and determinants in general (Fisher et al., 2012, Gavin et al., 2005, Lancaster et al., 2010a, Beck, 1996, Bennett et al., 2004, Upadhyay et al., 2017), whereas, there has been limited research on the association of nutrition with perinatal depression (Trujillo et al., 2018, Baskin et al., 2015). A recent review has highlighted the need for research, examining the potential synergistic impact of depression and nutrition. Stress and mental health problems can contribute to unhealthy eating patterns during pregnancy, which can affect the neurocognitive development of a child(Monk et al., 2013)

There is a need to synthesize the evidence showing link between prenatal depression and dietary practices among pregnant women. This review is endeavoring to highlight connection between depression and dietary intake among expectant women that is likely to have significant effects on health of both the mother and the fetus. This will help the experts in understanding the phenomenon that health of babies and mothers never improve by focusing only on diet practices of pregnant women. Rather depression associated with inadequate dietary intake also needs to be treated promptly in order to prevent relapses and to achieve the goal of healthy mothers and babies. Hence the pertinent review question to be addressed here is: What is the association of prenatal depression with dietary intake of women?

Dietary intake is defined as adherence to items from certain food groups, food-derived intake of nutrients which encompasses complex interactions between different ingested nutrients and compounds.

8.3 Methods

8.3.1 Search Strategy

We conducted a comprehensive literature search using the MeSH terms and free text key words in two steps to identify all possible studies. In the first step our search combined Dietary terms with maternal depression terms. The second step combined search related to dietary terms with depression terms and maternity terms separately as below:

- First step,
    - **Dietary terms**: diet, nutrition, food, dietary intake, food intake, dietary supplement, micronutrient

      And

    - **Maternal depression terms**: perinatal depression, antenatal depression, prenatal depression, postnatal depression, postpartum depression, maternal depression, maternal mental health
- Second step,
    - **Dietary terms:** diet, nutrition, food, dietary intake, food intake, dietary supplement, micronutrient

      And

    - **Maternity terms**: pregnancy, pregnant, mothers, maternal, antenatal, prenatal, perinatal, postnatal, postpartum

      And

    - **General Depression terms**: depression, depress, mood disorder, depressive disorder, mental health, depression in pregnancy

The databases searched include PubMed, CINAHL. EMBASE, ERIC, PsycINFO, Cochrane Library and Google Scholar for titles and abstracts of only Published English articles. Following this, two designated faculty members did a scrutiny of available literature based on their titles and abstracts and full version of selected studies were obtained for data synthesis.

Backward searches using reference and bibliography lists from articles of interest were also part of the search strategy. Any disagreement on selection of studies between reviewers was sorted out by discussion with principal investigator.

8.3.2 Eligibility

Articles in present review were eligible if they were published during 2000 to 2017, in English and indexed in the databases mentioned above, presenting the measures of association for pre-natal depression and dietary intake. We broadened our search by including those studies which showed association of perinatal depression and dietary intake as the number of articles just focusing on prenatal period was scarce. Those studies which were taking dietary and depression measurements in prenatal period were included from amongst the perinatal studies. In addition, we also included studies in which dietary or depression measurements were taken in prenatal period and outcome measures postnatally. The review was also extended to the studies which evaluate the association between depression and dietary intake in postnatal period. Studies with analytical design were included in review we could not find a qualitative study relevant for the review.

As far as the dietary measurement is concerned we included studies evaluating specific diet patterns or intake of nutrients through food or supplements using validated food frequency, food recalls and eating habits and behaviors questionnaires.

For maternal depression we included studies which used a validated depression screening tool or clinical diagnosis by a specialist. Studies with self-reported depression in perinatal period were also included in review.

We did not include studies measuring food insecurity, hormone levels, and chemical analysis of nutrients or using nutritional biomarkers. Studies in which the participants were already diagnosed with depression or had comorbidities like diabetes, cardiac conditions etc., were not included.

To be eligible for review, relevance of each study identified by initial search was evaluated critically and selected for final inclusion in the review by reviewers. Any incongruity was resolved through discussion.

8.3.3 Data Extraction

A data extraction tool was developed comprising of general and specific information as seen in Table 34. General information is about authors, year of publication and study design and specific information is focused on study setting, sample size, time of assessment (Prenatal or Post-natal) measurement (about depression and nutrition) and measures of association. A descriptive summary of studies under review is presented as meta-analysis could not be performed due to the less number of studies found on the topic and the dietary and depression measurements are highly varied.

Table 34: Characteristics of the studies included in the systematic review

Study Characteristics					Nutrition		Depression		Results	
DIET PATTERNS		**Study design**	**Depression prevalence**	**Nutrition/ diet**	**Tool Recall/ intervention period**	**Assessment Time**	**Tool; cut off value**	**Assessment Time**	**Association**	**Adj. model**
Authors & year	Setting and sample size (n)									
(Chatzi et al., 2011)	Heraklion, Crete, Greece. n = 529	Prospective mother–child cohort. 1	14%	PCA Dietary components classified into "western" or "health conscious"	FFQ Pregnancy	mid-pregnancy (14 -18 weeks of pregnancy)	Edinburgh Postnatal Depression Scale EPDS; 13	8-10 weeks Postpartum	high adherence to a 'health conscious' pattern with lower EPDS scores	Yes
(Barker et al., 2013)	UK. 6979 mother-offspring pair	Longitudinal	-	Food groups based on various diets and drinks classified as 'healthy' (fish, non-meat protein and vegetables) and 'unhealthy' (processed food and junk food) food groups	FFQ by Maternal reports of the nutritional environment	Prenatal (32 weeks gestation and 47 months postpartum)	EPDS-Maternal depression symptoms	Five times between 18 week gestation to 33 months postpartum	higher depressive symptoms to lower levels of healthy nutrition & higher levels of unhealthy nutrition	-
(Paskulin et al., 2017)	Brazil 712	Cross Sectional	21.6% depression General Anxiety 19.8%	3 dietary patterns, restricted, varied, and common-Brazilian	FFQ pregnancy	16 – 36 weeks of pregnancy	Primary Care Evaluation of Mental Disorders (PRIME-MD)	Prenatal	The common-Brazilian pattern of eating was associated with a higher occurrence of major depressive disorder compared with the varied dietary pattern	Yes
All Nutrients			–							

(Bae et al., 2010)	Korea. 114	Cross Sectional Survey		Nutrient intakes were analyzed using a nutrition evaluation program, Can-pro. Nutrients group classified as energy intake, macronutrient (carbohydrates, proteins & fats) & micronutrients (vitamins and minerals)	24-hour recall method	Prenatal	BDI (Beck Depression Inventory) with slight modification; Cut off = 10 (scores < 10 points was classified as low-depression & > 10 points as high-depression score)	Prenatal	Overall Dietary intake of all nutrients including micro and macro nutrients for low depression(LD) group was slightly higher than high depression (HD) group	Yes
(Lukose et al., 2014)	South India N=365	Cross sectional as part of a prospective RCT.	33%	The questionnaire yielded nutrient information on 27 macro- and micro-nutrients. Energy-adjusted nutrient intakes were calculated by residual methods. Nutrients were grouped as energy, protein, fat, carbohydrate, vitamin B12, folate, vitamin C and iron derived from the FFQ.	Food frequency questionnaire (FFQ)	Prenatal but FFQ estimated the habitual dietary intake for the 3 months preceding the study	Kessler Psychological Distress Scale (K-10) used to identify Subjects with antenatal depressive symptoms (if K-10 scores ≥ 6).	Prenatal	The dietary intakes in the first trimester were positively associated with vomiting, and negatively with anemia, Nutrient intakes, serum vitamin B12, methylmalonic acid, homocysteine and red cell -folate levels were not associated with measures of depression.	Yes

(ud Din et al., 2014)	Pakistan N=230	Cross Sectional	45%	Dietary data from FFQ were used to determine average amounts and frequency of consumption of food categories [energy, carbohydrate, protein, fat, fiber, minerals (calcium, iron, zinc, phosphorus) and vitamin (A, B1, B2, B3, C)]. FVS.was generated	Semi-quantitative food frequency questionnaire (FFQ). dichotomized at the median value to generate 'high and low' dietary diversity (DD) groups	prenatal	Depression, Anxiety and Stress scales (DASS-42). Women with symptoms of DASS were those who had scores for depression, anxiety and stress higher than the cut-off values for all the three negative psychological traits.	Prenatal	No difference in energy and macronutrient intake between women with or without DAS symptoms. Higher fibre intake and lower intakes of micronutrients such as calcium, iron and vitamin B3 and a less diverse diet in women with depressive symptoms	yes
(Saeed et al., 2015)	Pakistan N=94	prospective cohort study 2	43%	Adequate dietary intake was analyzed For fruit ,vegetables and proteins To categorize carbohydrate intake a cut-off point of ≥ 175 g and for protein ≥ 71 g and for fat (20 % of mean caloric requirement) was used to calculate minimum fat requirement.	The Healthy Eating Index (HEI) was used to analyze 24 h recall and Food Frequency Checklist. Maximum score was 50, a score ≥ 40 indicated good diet, score	36th week of gestation	(EPDS). A score < 9 indicated absence of depression and > 9 as depressed.	Prenatal	Incidence of poor maternal dietary intake was more in females with antenatal depression. Antenatal depression increased the risk of poor Healthy Eating Index.	
Micro -Nutrients					Plasma folate and		EPDS (scores ≥15 during	Prenatal	Low Folate level with more antenatal	Yes

(Chong et al., 2014)	Singapore 709	Longitudinal study from a population based cohort.	7.2% antenatal & 10.4% postpartum depression	Plasma folate and vitamin B12 level. Folic acid	vitamin B12 level. At 26th-28th weeks of gestation.	Prenatal (At 26th-28th weeks of gestation)	pregnancy or ≥13 at postpartum indicate depression.	At 26th-28th weeks of gestation and 3-month postpartum	but not with postpartum depression. No association of vit B12 & depression	
(Fowles et al., 2012)		Cross sectional	17 out of 18 women	Average DQI-P scores were calculated from the three 24-hr recalls for data analysis. To complete the DQI-P, the volumes of intake from the grain, fruit, and vegetable food groups, nutrient amounts, percentage of total caloric intake from fat, and meal patterns (number of meals and snacks) were used.	The 24-hr recalls for dietary intake. The Dietary Quality Index–Pregnancy (DQI-P); The DQI-P score above 70 reflects the most desirable eating pattern.	Prenatal	The Center for Epidemiologic Studies–Depression Scale (CES-D) with a cut-off of 16, Stress and Social Support subscales of the Prenatal Psychosocial Profile (PPP), and the Emotional Eating Scale (EES)	Prenatal	Emotional eating in response to anger was negatively related to intake of iron and folate-rich foods, and emotional eating in response to anxiety was negatively related to intake of folate-rich foods. Depressed women had an increased intake of calcium-rich foods	Yes
Eating Behaviors				Three subscales of the EAT have been Identified but Factor I scores are reliable in pregnancy and the postpartum period. Therefore only total and Factor I scores were used in this study. Factor I,"dieting," assesses preoccupations with shape and pathological avoidance of fattening foods.	postpartum eating attitudes (EAT): 26-item self-report measure.	Pregnancy, 4-month, and 14-month postpartum	CES-D for depressive symptoms, State Trait Anxiety Inventory (STAI)-anxiety symptoms	Pregnancy, 4-month, and 14-month postpartum	Positive association between symptoms of depression and anxiety in perinatal period (both during pregnancy and after) and their eating patterns and BMI. The association was significant only in postpartum period.	
(Carter et al., 2000)	64 women	Prospective study (cohort)4								

(Micali et al., 2011)	Bristol 10887	Cohort5 study	13.9 to 40.5% in index groups and 10.6% in control group.	The shape and weight concern sub-scales of the Eating Disorders Examination questionnaire (EDE-Q).	Eating Disorders Examination Questionnaire (EDE-Q) Women with either a score of >2 on the EDE-Q, or presence of pregnancy SIV/laxative use were classified as having current ED symptoms, and with 0 as none of these symptoms.	Prenatal (at 18 weeks in pregnancy)	Crown-Crisp Experiential Inventory (CCEI) to assess "probable Anxiety disorder" using a cut-off of 30 and EPDS for "probable depressive disorder" using the cut-off of 12.	Perinatal (at 18 weeks and 32 weeks in pregnancy, 8 weeks and 8 months post-partum)	Women with depression before pregnancy were more likely to develop depressive and anxiety symptoms during the pregnancy leading to eating disorders and change in appetite. 8 months postpartum showed the most significant association between depressive symptoms and eating disorders.	Yes

(Hurley et al., 2005)	Baltimore N=134	Cross-sectional observational		Quantified average daily intakes for 30 nutrients, energy intake from sweets, protein, carbohydrates, fats, and alcohol; and average weekly frequencies for food groups (vegetables, fruits, bread, milk, meat, fat/oil/sweet/snack).	Health Habits and History Questionnaire (HHHQ) including FFQ	Prenatal (28 weeks of gestation)	Spielberger State-Trait Anxiety Inventory; Profile of Mood States to classify depression, fatigue & anger; Perceived Stress Scale	Prenatal (commenced at 24 weeks' gestation and continued at monthly intervals)	Variations in dietary intakes were associated with fatigue, stress, and, to a lesser extent, anxiety. Stress was associated with higher intakes of energy,fats,proteinir on, and zinc, foods from the fats, oils, sweets, and snack group. Anxiety was negatively associated with vitamin C and positively with higher intakes of foods from the fats, oils, sweets, and snack group.	Yes
Oily fish and vegetarian diets		Retrospective survey (Cross sectional)	20.8%	Questionnaire included foods with high content of nutrients and anti-nutrients, previously linked to PPD as well as foods rich in antagonistic compounds of the nutrients Supplements included multivitamin & minerals.	Non quantitative food frequency questionnaire covered food and supplement intake during a pregnancy	Postpartum	Participants reported PPD	Postpartum	oily fish, offal and vegetarian diets negatively correlated with depression	
(Hogg-Kollars et al., 2011)	Austria 400									

(Sontrop et al., 2008)	Canada 2394	Cross sectional	19%	Intake of fish and EPA+DHA	FFQ and 1 month recall	First and second Trimester	CES-D; 16	Second or third Trimester	No associations of depressive symptoms with intake of fish and EPA+DHA,	Yes

8.4 Results

8.4.1 Operational Definitions

Perinatal depression encompasses depression during and after termination of pregnancy and it can be defined as "an episode of major or minor depression with an onset either during pregnancy (prenatal/antenatal depression), or during the first 12 months (postpartum/postnatal depression)" (Mallikarjun and Oyebode, 2005).

The DSM-IV and ICD-10 are both operational diagnostic systems that attempt to classify all known psychological disorders according to the number of criteria symptoms that are simultaneously present and their adverse impacts on social functioning (Jablensky, 1999).

Following are the signs and symptoms provided by American Psychiatric association (APA) for the diagnosis of depression: -

- Depressed mood most of the day
- Anhedonia (significant loss of interest or pleasure in activities which were previously enjoyable)
- Significant weight loss or gain of more than 5% of body weight in one month
- Psychomotor changes as observed by others (restless, agitated or slow)
- Fatigue or diminished energy level
- Feelings of worthlessness or inappropriate guilt
- Decreased concentration or indecisiveness
- Recurrent thoughts of death or suicide plan, or attempt (APA, 2000a).

An individual would be diagnosed with minor depression if a minimum of two and not more than five of the signs and symptoms mentioned above are present for a period of two weeks, with one of those symptoms being depressed mood or anhedonia (Association, 2000b, Judd et al., 2005). If five out of nine criteria are met in two weeks, with depressed mood or anhedonia (loss of interest or pleasure) as one of the symptoms then it is considered to be a case of major depression(Association, 2000b).

8.4.2 Study selection

Selection process of studies is seen in fig 16. From the selected databases 1585 articles were identified. The titles and abstracts were screened and 1437 articles were

excluded and 148 studies were selected, their full texts retrieved and checked for eligibility. Fourteen studies were included in review containing 4 cohorts, 8 cross sectionals and 2 longitudinal and 2 surveys which represent 23629 subjects in all the studies. Studies have been divided into four groups:

- First group has 1 cohort, 1 cross sectional and one longitudinal study considering dietary patterns like western or health conscious or healthy and not healthy.
- Second group has 3 cross sectional studies and one cohort study in which all major macro and micronutrients in the diet are evaluated.
- Third group has one cohort and one cross sectional study in which specific intake of micronutrients like folate and calcium are associated with depression.
- Fourth group has 3 studies, 2 cohorts and one longitudinal considering various eating behaviors.
- Final group has 2 cross sectional studies with specific food items like oily fish and fats and its association with depression.

In the selected studies depression was measured by various screening tools. In 4 cohort studies EPDS with a different cut off ranging from 9 to 15 was used. Two cross sectional and one cohort study used CES-D with a cut off score of 16. One cross sectional study measured depression with Beck's Depression Inventory (BDI) with 10 score and another used K10 with >6 as cut off for depression. Primary Care Evaluation of Mental Disorders (PRIME-MD) was used to screen for mental disorders in a cross sectional study. Depression Anxiety and Stress Scale (DASS-42) and State Trait Anxiety Inventory (STAI) were used to asses depression and anxiety symptoms in a cohort study and in a cross sectional study. In another cohort study, in addition to EPDS, Crown-Crisp Experiential Inventory (CCEI) to assess "probable anxiety with a cut-off of 30 was also used.

In the reviewed studies the prevalence of prenatal depression varied from 7.2 – 21.6% (Paskulin et.al, 2017; Chong et.al 2014; Micali et.al, 2010; Sontrop et.al, 2008).

Other studies reported much higher prevalence from 33% - 45% (Lukose et.al, 2014; Saeed et.al, 2015; ud Din et.al, 2014; Micali et.al, 2014) . Prevalence reported in postpartum period was not as high, ranging from 10.4% - 20.8% (Chong et.al, 2014 ; Chatzi et.al, 2011; Sontrop et.al, 2008).

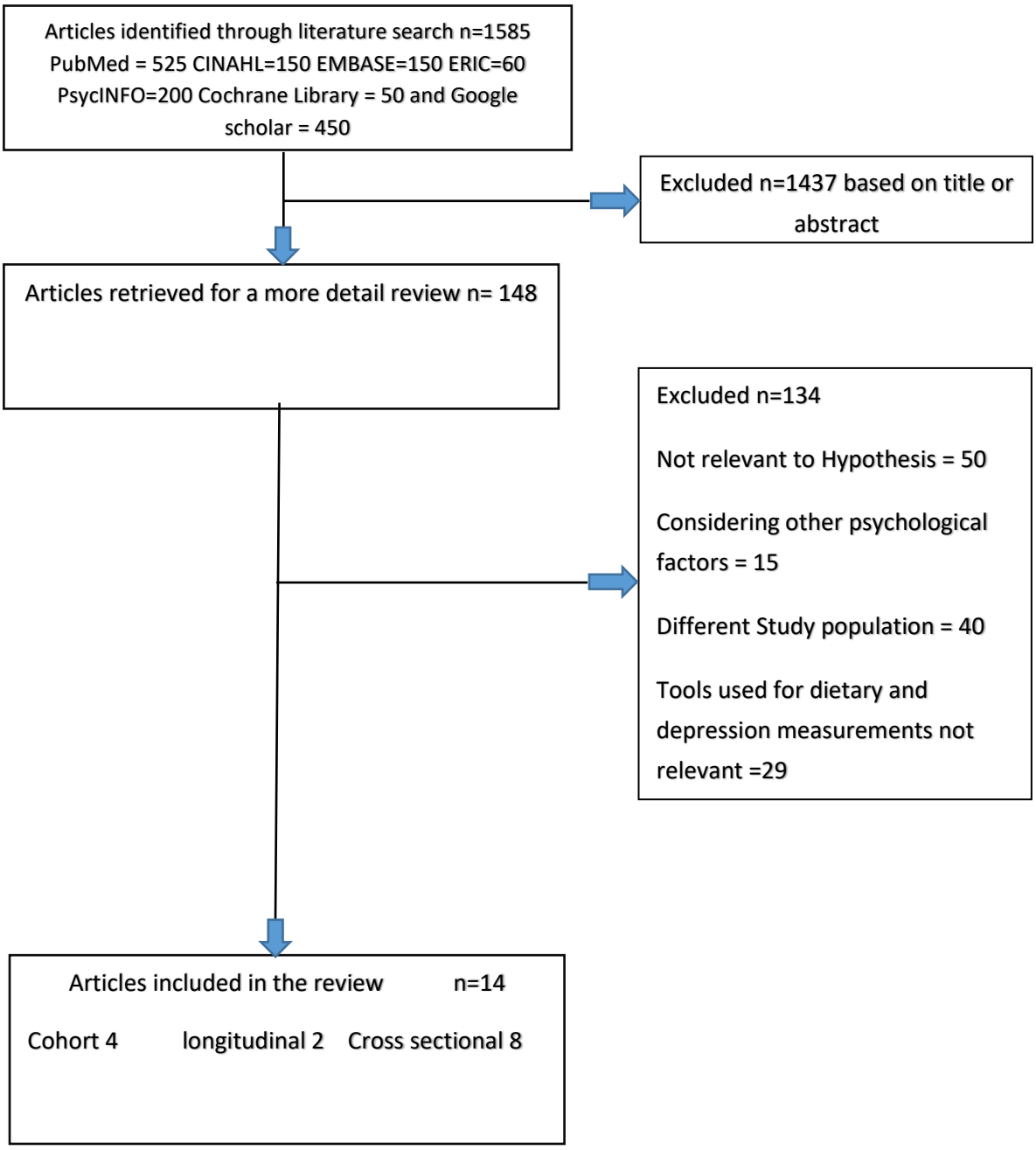

Figure 16: Systematic Literature Review Process

8.5 Quality Assessment

A checklist had been prepared after thorough literature search (Mirza and Jenkins, 2004, Fisher et al., 2012, Waqas et al., 2018) to assess the quality of the studies to be included in the systematic review. This checklist comprised of total 12 items that help in elucidating the quality of the studies. Five items were related to the methodology and included information about clarity of aims and objective, adequacy of sample size, representativeness of sample, response rate, study design, while another five explained the analysis which encompassed data description, appropriate univariate and multivariate analysis, reporting on null finding and generalizability issues. For ethical consideration, obtaining informed consent form participants had also been included in the checklist. Three assessors from the faculty had scored the studies against the checklist. Cross-sectional study design and absence of any characteristics scored as "0" while analytical study design and presence of characteristics gave "1" point. Based on these criteria maximum score was 12.

Table 35 shows quality assessment of the studies included in the present review. Out of 14 studies chosen for the systematic review, only one study (Hogg-Kollars et al., 2011) did not mention its aims and objectives clearly and the same study did not use a valid questionnaire to report depression as they relied on participants reporting Post-partum Depression (PPD). Except two studies (Fowles et al., 2012, Bae et al., 2010), all others used adequate sample size while only nine studies justified representativeness of its sample. Eight studies used cross-sectional study design, whereas others were cohort or longitudinal. None of them was experimental.

All studies described the data adequately but only five studies mentioned the response rate of participants. Only three studies did not mention taking informed consent from the participants before initiation of the study. As far as analysis is concerned, all but one applied appropriate univariate analysis while multivariate analysis was performed by total twelve studies. Two studies did not report null findings of the research and five did not discuss generalizability issue of the research findings.

Table 35: Quality Assessment

Author	Clear study aims	Adequate sample size or justification	Representative sample or justification	Measures of depression reliable and valid	Response rate reported, Loss of sample due to attrition reported	Adequate description of data	Appropriate univariate statistical analysis	Multivariate statistical analysis	Informed consent received?	Discussion of generalizability	Null finding reported	Prospective case control (1)/Cross sectional design
Chong et al.	1	1	1	1	1	1	1	1	1	0	1	1
Fowles et al.	1	0	0	1	0	1	1	0	1	1	1	0
Hogg-kollars et al.	0	1	0	0	0	1	1	0	0	1	1	0
Sontrop et al.	1	1	0	1	1	1	1	1	1	0	1	0
Carter,et. Al 1998	1	1	0	1	0	1	1	1	1	0	1	1
Hurley and L. E. Caulfield 2005	1	1	0	1	0	1	1	1	1	1	1	0
Micali ,et.Al 2001	1	1	1	1	0	1	1	1	1	1	1	1
Hyun Sook Bae,2010	1	0	1	1	0	1	1	1	1	0	1	0
Ammu Lukose, 2013	1	1	1	1	0	1	1	1	1	1	1	0
Zia ud Din, 2014	1	1	1	1	0	1	1	1	1	1	1	0
Ayesha Saeed, 2016	1	1	1	1	1	1	1	1	1	1	1	1
Chatzi et. Al	1	1	1	1	1	1	1	1	1	0	0	1
Paskulin et. Al	1	1	1	1	1	1	1	1	0	1	1	0
Barker et. Al	1	1	1	1	0	1	0	1	0	1	0	1
0 denotes No, 1 denotes Yes												

8.5.1 Results from the studies

In this section results of the studies are discussed according to the groups.

Dietary Pattern

One cohort, 1 cross sectional and one longitudinal study considered the association of dietary patterns with pre-natal depression.

A prospective, population based cohort study conducted by Chatzi et al in Greece, investigated whether dietary patterns during pregnancy are related to postpartum depression (PPD) in 529 women. By using FFQ in mid pregnancy and the Edinburg Postpartum Depression Scale (EPDS) at 8–10 weeks postpartum at cut-off value 13, Principle component analysis (PCA) and factor loading to identify two different dietary patterns, 'healthy' and 'Western'. Healthy pattern found as protective factor against PPD in second and third tertiles (RR =0.52 and 0.51 CI 0.30-0.92 and 0.25-1.05 P =0.03 and 0.07) respectively compared to least healthy tertile after adjusting for confounders and p for trend in adjusted model was 0.044. Similar significant association was found when depression scores were used as continuous variable (highest v. lowest tertile: β-coefficient = 1.75, P = 0.02, p for trend = 0.022).

Barker et al conducted a longitudinal study in 6979 mother–offspring pairs, which showed how an unhealthy dietary pattern of a woman is related to higher incidence of antenatal depression and a healthy diet can lower the probability of maternal depression; furthermore, the research went a step ahead to study the cognitive function of the child as well. Study results showed that prenatal depression was associated with unhealthy diet ($p<0.05$) and ultimately with less child cognitive function. In second model, prenatal depression symptoms were related to less prenatal healthy diet ($p<0.05$). Both model showed no significant association of prenatal depression with postnatal dietary habits ($p>0.05$).

To evaluate the association between dietary patterns and mental disorders among pregnant women in southern Brazil, Paskulin and colleagues conducted a cross sectional study. Dietary patterns of the sample were determined by cluster analysis, three dietary patterns - restricted, varied, and Common-Brazilian were identified. Food items mostly found in the "restricted dietary pattern" were cookies, French fries, snacks, soft drinks,

natural juice, whole milk, cocoa powder, yogurt, and ice cream. Grains, cereals, and tubers; breads, cakes, and cookies; fruits; and vegetables were included in "varied pattern". The "Common-Brazilian pattern" was composed of french rolls, beans, boneless beef/chicken or eggs, coffee with sugar, margarine, and artificial juices. Overall the prevalence of depression was 21.6% (95%CI 18.7- 24.6). Women who presented a "Common-Brazilian dietary pattern" had a 62% higher prevalence of major depression and showed statistically significant association (PR 1.62; 95%CI 1.15-2.30; $p<0.01$) when compared to "varied pattern" of consumption. This association remained significant even after adjusted for potential confounders (PR 1.43; 95%CI 1.01-2.02; $p=0.04$) but with slightly lower values. "Restricted dietary pattern" showed no significant association with major depression symptoms as we compared to "varied pattern" ($p>0.05$). When major depressive symptoms compared with various food groups, it was found that low consumption of fruits (PR 1.43; 95%CI 1.04-1.95; $p=0.03$) and high consumption of sweets/sugars and (PR1.91; 95%CI 1.19-3.07; $p=0.01$) were associated significantly with higher prevalence even after adjusted for confounders.

All Nutrients

Three cross-sectional and one cohort study used FFQs and 24-hour recall questionnaire to quantify essential nutrients from all food groups.

A hospital-based, prospective cohort study was conducted on 94 middle class antenatal attendees at the beginning of second trimester in a tertiary care hospital in, Pakistan (Saeed et al., 2016a). Exposure was antenatal depression, measured by EPDS. Overall 43% of women were depressed at a cut-off point of 9 on EPDS. Maternal dietary intake was measured through 24 Hour Recall and Food Frequency Checklist at the start of cohort and again in 36th week of gestation. Baseline maternal dietary intake (24 h recall) revealed that mean difference of just one Healthy Eating Index (HEI) score between depressed (24.3 HEI score) and non- depressed (25.3 HEI score) antenatal women at the initiation of study had increased to 5 ± 5.3 HEI scores at the end of the cohort with 21.2 HEI score for depressed and 26.2 HEI score among non-depressed antenatal women. Saeed et al found that at the end of cohort, poor maternal dietary consumption attributed 62% to antenatal depression with higher incidence of poor

maternal dietary intake among antenatal depressed females than non-depressed (R.R = 2.582; CI 1.60–5.23; p<0.001).

The three cross sectional studies assessed the prenatal women for depression and dietary intake in antennal clinic in Korea and tertiary care hospitals in India and Pakistan. In the Korean (Bae et al., 2010) study , BDI was used for degree of depression in pregnant women. The group with less than 10 points, was classified as low-depression (LS) score group, and the one with more than 10 points was high-depression score (HS) group. Though the LS group showed higher intake tendency in consumption of most nutrient intakes than HS group, but no significant difference was found among LS and HS groups in terms of total energy intake and macronutrients (p>0.05). In micronutrients, consumption of total calcium (p=0.017), plant calcium (p=0.014), plant Fe (p=0.008), potassium (p=0.001), total folate (p=0.043) and dietary folate (p=0.006) were found higher among LS than HS group and the differences was statistically significant.

In an Indian study by (Lukose et al., 2014), women in early pregnancy were screened for depression using Kessler Psychological Distress Scale (K10). An interview administered FFQ was used to estimate the habitual dietary intake for the preceding 3 months. Energy adjusted nutrients intake was slightly higher among non-depressed women as compared to depressed except folic acid, consumption of which is slightly higher among depressed and the intake of phosphorus was equal among both the group. Despite the difference in intake of nutrients among two groups, no statistically significant association was found between depressive symptoms and intakes of energy, protein, fat, carbohydrate, vitaminB12, Folate, vitamin C and iron status (all p>0.05). Significant associations of less depressive symptoms with anemia as compared to non -anemic (24 vs. 37 %, p = 0.021) and microcytic anemia (37 vs. 22 %, p = 0.018) were found.

The cross sectional study in Pakistan examined the association of psychological distress with dietary intake of food groups, energy, macronutrients and micronutrients in 230 women enrolled in antenatal clinic. Psychological symptoms were assessed using (DASS-42). Assessment of maternal dietary intake was carried out using a validated semi-quantitative (FFQ). Data from the FFQ was also used to generate a food variety score (FVS). In both the unadjusted and adjusted analysis, no significant differences in mean

intake of dietary energy, carbohydrate, fat or protein between the two groups were found ($p>0.05$) but intake of calcium (688; 95%CI 645, 731; $p=0.001$), iron (8.61; 95%CI 8.43, 8.79; $p=0.001$) and vitamin B3 (14.39; 95%CI 13.88, 14.90; $p=0.003$) was significantly higher in women without DAS symptoms than in distressed women while unadjusted and this association was reinforced with slightly higher values when adjusted for confounders. FVS of the distressed group was lower in both unadjusted (mean FVS 27; 95%CI 24, 29; $p=0.000$) and adjusted (mean FVS 26; 95%CI 24, 29; $p=0.000$) models than that of the group without DAS symptoms.

Eating behavior

One cross sectional and two longitudinal studies considered the association of eating habits with perinatal depression.

In a longitudinal prospective study conducted by Alice S. Carter, associations between body mass index (BMI; kg/m2), eating attitudes, and affective symptoms during pregnancy and the postpartum period was described in a sample of 64 women. The majority of mothers were middle class married Caucasian or living with the baby's father. Women were enrolled during pregnancy and monitored prospectively to 14 months postpartum. Measures included self-reported pre-pregnancy and 4-month postpartum BMI as well as pregnancy, 4-month, and 14-month postpartum eating attitudes (EAT), depressive symptoms (CES-D), and anxiety symptoms (STAI). Results showed evidence for a significant, albeit moderate, relationship between high BMI and symptoms of depression at 4 months (mean CES-D 19.5 ±6.4; $p<0.008$) and 14 months (mean CES-D 19.1±4.2; $p<0.008$) postpartum. On regression analysis, 4 months post-partum eating attitudes ($p<0.05$) and BMI ($p<0.01$) found as predictors of depressive symptoms at 14 months post-partum.

In a cross-sectional observational study, conducted by K. M. Hurley, one hundred thirty-four women with low-risk normal pregnancies showed association of six indices of psychosocial wellbeing with dietary intake at 28 weeks of gestation. Psychosocial characteristics, including anxiety, depressed mood, anger, fatigue, social support, and stress were assessed between 24 and 32 weeks of gestation. Psychosocial factors were measured by using Spielberger State-Trait Anxiety Inventory (STAI), Pregnancy

Experience Scale measures, Profile of Mood States, Perceived Stress Scale, Marlowe-Crowne Social Desirability Scale. Health Habits and History Questionnaire (HHHQ), which includes a food frequency questionnaire, were used to estimate usual dietary intake. Pearson product-moment correlations were calculated to determine the relationships between psychosocial factors and diet. Significant correlation of maternal stress was found with consumption of total energy (Pearson correlation 0.22; $p<0.05$), fat (Pearson correlation 0.24; $p<0.01$), proteins (Pearson correlation 0.24; $p<0.01$), iron (Pearson correlation 0.21; $p<0.05$), and zinc (Pearson correlation 0.24; $p<0.01$) but the association lost significance after adjusted for total energy intake.

Nadia Micali and colleagues conducted a longitudinal, prospective study of women and pregnancy which was part of the Avon Longitudinal Study of Parents and Children (ALSPAC). This study investigated the effect of past depression, past and current eating disorders (ED) on perinatal anxiety and depression in a large general population cohort of pregnant women. Anxiety and depression were measured during and after pregnancy in 10,887 women using the Crown-Crisp Experiential Inventory (CCEI) and Edinburgh Postnatal Depression Scale. Women were grouped according to depression and ED history. The course of depression and anxiety were compared with linear mixed-effect regression models; and probable depressive and anxiety disorders using logistic regression.

Women with both past depression and past/current ED had high depression in perinatal period; this was most marked in the group with pregnancy ED symptoms and past depression (b coefficient: 5.1 (95% CI: 4.1–6.1), $p<0.0001$), especially at 8 months post-partum. Multivariate logistic regression showed that at 18 weeks of gestation all women except those with past ED had a higher risk for a probable depressive disorder as compared to non-psychiatric controls. At 8 months the group with post-partum pregnancy ED symptoms and/or past depression conferred the highest risk for a probable depressive and anxiety disorder. Results showed Pregnancy ED symptoms and past depression have an additive effect in increasing the risk for depression and anxiety in perinatal period. Likelihood ratio of a probable depressive disorder at 8 months post-partum was decreased to 8.2–39.1% in various groups as compared to non-psychiatric controls.

Micro-Nutrients

One cross-sectional and one cohort study with an aim to assess the association of micro-nutrients with depression were included in the present systematic review.

Cross- sectional study was conducted by Fowles et al in central Texas. Total 18 women were recruited to assess the correlation among maternal depression and dietary intake. The Center for Epidemiologic Studies–Depression Scale (CES-D) was used to assess depressive symptoms among participants. Higher scores indicated higher frequency of depressive symptoms. The Dietary Quality Index–Pregnancy (DQI-P) was used for nutritional assessment. DQI-P scores of >70 indicate good adherence to dietary recommendations. Non-parametric Spearman's rho was used to correlate maternal depression and self-reported dietary consumption. Depression was significantly correlated with calcium-rich food intake (spearman's rho = 0.60, p = 0.018). Due to small sample size, the results of this study should be interpreted with caution.

A prospective cohort study was conducted to assess the relationship of folate and vitamin B12 concentrations during pregnancy with probable antenatal and early postnatal depression by Chong et al. Asian, (Chinese, Malay, and Indian), mothers were included in the study who were residents of Singapore. Data on depression was collected from total 709 women by using EPDS at 26th week gestation and 3 months postpartum. EPDS scores ≥15 during pregnancy or ≥13 at postpartum indicate depression. Plasma folate and vitamin B12 levels of participants were estimated by blood tests. Independent two samples t-test for continuous variables and the chi-square test for categorical variables as well as multiple logistic regressions were performed for statistical analysis. Rates were adjusted for maternal age, ethnicity, educational level, gravidity and variables associated with health status of mothers. Plasma folate level was significantly lower among women with antenatal depression than non-depressed (p=0.011). Logistic regression model after adjusted for confounders showed that likelihood of antenatal (95% CI: 0.52, 0.94, p=0.016) and post-natal depression (95% CI: 0.58, 0.99, p= 0.040) was decreased by a factor of 0.69 and 0.75 for a unit increase in folate level respectively. No significant association of vitamin B12 was found with antenatal and postpartum depression.

Oily fish and vegetarian diets

Only two studies fulfilled the criteria to be included in this group of present systematic review; out of those, one was retrospective survey and the other one was cross-sectional study.

Hogg-kollars et al, in 2011, conducted a retrospective survey in Austria on 400 pregnant women recruited from 2003 to 2008, to correlate post-partum depression with various nutrients and anti-nutrients taken through food or supplements. Recruited mothers were classified into two groups as with or without postpartum depression on self-report basis. A Food Frequency Questionnaire comprising of 55 items was used to collect information about nutrients and anti-nutrients taken during pregnancy. Discriminant analysis, independent t-test, Pearson's product moment correlation and crosstabs with chi-square tests were used for inferential statistics along with descriptive statistics. Intake of oily fish ($p= 0.03$) and offal ($p= 0.01$) were significantly higher among depressed than non-depressed women. Women on vegetarian diet (47.4%) were more depressed than those who were on non-vegetarian (19.4%) diet (Pearson) [Chi-square = 8.6; df= 1, $p =0.003$].

A cross-sectional study was conducted by Sontrop et.al, on 2394 pregnant women in Canada. Food-frequency questionnaires (FFQ) and Center for Epidemiologic Studies – Depression Scale (CES-D with a cut-off ≥16) were used to assess nutritional status and depression respectively. Marine food was categorized into four verses canned food, dark meat fish, other fish and shrimp/lobster/scallops. Consumption of EPA+DHA in mg/100 g of marine food in above mentioned categories was 0.57 mg/100 g in canned tuna fish; 1.57 mg/100 g dark meat fish; 0.35 mg/100 g in other fish and 0.25 mg/100 g in shrimp/lobster or scallops. In order to see the association of CES-D scores with fish & EPA+DHA, sequential multiple linear regressions were performed. This study revealed 18.8% women with probable depression. Multiple regression analysis showed protective effect of >1/week fish consumption on depression ($b = -0.8$, CI: -1.5, -0.1, $P<0.05$) however, after control for confounders this association lost statistical significance. Consumption of more EPA+DHA was associated with less depressive symptoms but only in current smokers and women of single marital status.

8.6 Discussion

This systematic review of 14 studies has mainly shown association of perinatal depression with dietary intake, whereas one study did not show any association. Three studies showed protective effect of diet patterns like healthy diet(Barker and Thornburg, 2013a), health consciousness (Chatzi et al., 2011) and varied diet (Paskulin et al., 2017) which mostly consisted of cereals, non-meat proteins, dairy products ,fish ,green vegetables and fruits in pre and post-natal periods. One study also reported protective effect of micronutrient (folate level) with prenatal depression(Chong et al., 2014). Another study(Hurley et al., 2005) on diet behavior observed protective association of Vitamin C with anxiety. While Hogg-collars and colleagues found higher intake of oily fish, offal and vegetarian diets among depressed women in postpartum period. Three other studies included in this review, found association of diet behaviors, (eating disorders, attitude and health habits) predominantly with postnatal depression. Association of energy, macro and micronutrients from diet with perinatal depression was observed in three studies in which low intake of micronutrients like calcium, iron and vitamin B3 was associated with depression whereas no difference in energy and some micro and macronutrient was observed. In order to clearly answer the question whether certain diets and nutrients influence the risk of perinatal depression, the discussion below is arranged according to the groups of studies. The issues discussed below need consideration in future study designs.

8.6.1 Dietary measurements

Most of the studies assessing the intake of macro or micro nutrients rely upon Food Frequency Questionnaires or 24 hour recall methods, where recall bias can interfere with the authenticity of the results(Tucker et al., 2013). Such assessment is usually done only once during the study with no pre-pregnancy baseline nutritional status available. During different phases of pregnancy dietary intake and demand for the nutrients may vary (Wu et al., 2004), Therefore, it is important to have a baseline measurement before pregnancy and then the subsequent measurements should be done at regular intervals.

Out of 14, in our review 9 studies have used FFQs (Barker and Thornburg, 2013a, Chatzi et al., 2011, Lukose et al., 2014, Hogg-Kollars et al., 2011, Hurley et al., 2005,

Paskulin et al., 2017, Sontrop et al., 2008, ud Din et al., 2014). Whereas, 24 Hour recall has been used by 4 studies either alone or in addition to FFQ (Chatzi et al., 2011, Bae et al., 2010, ud Din et al., 2014).

Blood analysis can verify what is processed and made available by the body. In this review blood analysis by three studies was done (Chong et al., 2014, Bae et al., 2010, Fowles et al., 2011) specifically for B12, folate, Iron indices and placental bio markers. This however does not capture unknown food compounds.

Nutrition is measured at only one point in time in studies but long time dietary habits are more important as baseline nutritional level is important for comparison. Only one study did that Lukose et.al, took pre study dietary recall measurements for the last 3 months. Three studies captured one month recall for food frequency (Chatzi et al., 2011, Paskulin et al., 2017, Sontrop et al., 2008). Rest of the studies captured either one week or two weeks' recall.

Only two studies measured dietary intake more than once at the start of cohort in early pregnancy and then at 36 weeks. The second study obtained 3, 24-hour recall on weekly basis. Three separate day recall are considered a sensitive measure of diet intake ($r=.78$, $p< .01$) with strong correlation between 3 and 7-day food records. There is high correlation between 24-hour recall and 7 days' food records. Twenty four hour recalls provide more accurate assessment of current dietary intake than either food records or food frequency questionnaire (Fowles et al., 2011).

Ideally, dietary intake should be measured at baseline or prior to pregnancy and again at several follow-up time points to control the recall bias of a FFQ. The timing of the measurements was highly variable in all the studies. Nine studies took measurements during prenatal time ranging from 14-36 weeks and two studies (Fowles et al., 2011, Barker and Thornburg, 2013a) measured in postnatal period.

Dietary intake and needs vary to a great extent in pregnancy and postpartum period the timings of measurements should be considered in multivariate analysis ,but in this review only one study included it((Chong et al., 2014) although all the studies except one used multivariate models .

8.6.2 Maternal depression measurement

Each study in the review used a different tool to measure depression, for example, EPDS and CES-D ,BDI, K 10, DASS-42 etc. Among the instruments measuring maternal depression, EPDS is the most extensively used tool (Gibson et al., 2009, Spies et al., 2009) and in our review six out of fourteen studies also used EPDS. It is a known fact that the best method to diagnose depression is a clinical interview, carried out by a trained professional; however, it may take more than an hour which makes it less suitable to be used in research settings(Bennett et al., 2004). The symptoms of depression vary during various stages of pregnancy, therefore, valid, reliable and easily administered tools are essential for correct and early diagnosis of depression (Noble, 2005b). A study by Su et al observed that the optimal cut-off score for EPDS is 12/13 (Su et al., 2007), whereas, in another study, the best cutoff score for EPDS was found to be ≥8 (Santos et al., 2016). In the present review, Saeed et al, used EPDS with a slightly lower cutoff score of ≥ 9. A score of less than 9 stipulated absence of depression and 13 was severe depression whereas a score of 9-12 was considered to be moderate depression (Saeed et al., 2016a). Whereas, the cut off scores ranged between ≥12-15 in pre and postnatal time periods in other studies (Micali et al., 2011, BARKER and THORNBURG, 2013b, Chatzi et al., 2011, Chong et al., 2014, Hurley et al., 2005). The other most frequently used screening tool in this systematic review is CES-D, which has been with a cut off score of 16 (Fowles et al., 2011, Sontrop et al., 2008) for prenatal depression and by Carter et al., where both pre and post-natal depression were measured. In a study K-10 compared well with the (EPDS) in detecting depression (Lukose et al., 2014). Another instrument used was BDI consists of 21 items and follows the DSM-IV criteria for depression. It detects intensity of depression in both psychiatric and normal populations (Smarr and Keefer, 2011), with a cut off score of ≥ 10 for detection of mild depression. In this systematic review, Bae et al also used BDI with a cut off score of ≥ 10 (Bae et al., 2010). DASS-42 has been found to be a reliable and authentic tool to identify the three states of psychological distress i.e. depression, anxiety and stress (DAS) separately. Moreover, it covers more general dimensions of psychological distress as well (ud Din et al., 2014).

History of depression prior to pregnancy is a known risk factor for perinatal depression, and antenatal depression may predict post-partum depression; therefore, it is

critical to include pre-pregnancy or antenatal screening measurements. In this review only one cohort study measured pre pregnancy depression along with Eating Disorder (ED). Women with past depression (independent of ED history) had higher depression and anxiety scores overall compared to controls. However both pregnancy ED symptoms and past depression conferred the highest risk over time (Micali et al., 2011). However five studies including two cohort, two longitudinal and (Chong et al., 2014). A cross sectional study took repeated measurements in pregnancy and postpartum (Micali et al., 2011, Hurley et al., 2005, Carter et al., 2000, Barker and Thornburg, 2013a, Chong et al., 2014).

It is important to understand that screening tools have good sensitivity and specificity, however, use of lower cut-off points may increase the number of false positives, resulting in over estimation of prevalence of depression in different trimesters of pregnancy (Gibson et al., 2009). For EPDS in this review a few studies have mentioned a sensitivity ranging from 57% to 95% ((Chong et al., 2014, Chatzi et al., 2011) while 100% sensitivity for K10 was reported in an Indian study (Lukose et al., 2014). High internal consistency (r = .85 - .90) and test retest reliability is reported for CES-D , BDI and DASS-42 (Fowles et al., 2011, Carter et al., 2000, ud Din et al., 2014).

8.6.3 Sources of Bias

There were four Cohorts, two longitudinal and eight Cross-sectional studies included in this systematic review. We were not able to find any RCTs related to our research hypothesis and none of them was a nested cohort. However, two of the studies, (Chong et al., 2014, Lukose et al., 2014), were part of large trials. One cross-sectional, was part of a cohort study(Paskulin et al., 2017). In cross-sectional studies it becomes hard to determine whether depression has led to poor dietary habits or vice versa. Three (One Cohort and two cross sectional) out of fourteen studies had a sample size of less than 200 which may have made it difficult to detect any differences in exposure and outcome measures.

Three studies observed healthy dietary patterns and association (Chatzi et al., 2011, Barker and Thornburg, 2013a, Paskulin et al., 2017) with perinatal depression. They found that health conscious diet, healthy diet and Brazilian food, consisting of vegetables, fruits and nuts, sea food, olive oil etc. are associated with lower levels of depression. Saeed

et, al., and Bae et, al., observed that there is a protective association between various micro and macro nutrients and level of prenatal depression. Low levels of folate (Chong et al., 2014), less oily fish and offal (Fowles et al., 2011)are associated with depression .The remaining studies did not report any significant associations.

The enrollment and inclusion criteria of study participants were described in detail and most of the studies adjusted for confounders.

8.6.4 Nutritional deficiencies

There is a great extent of variation in the settings where the studies in this review were carried out ,most of the studies were in the high income countries Like UK (Micali et al., 2011) Austria ((Hogg-Kollars et al., 2011) Singapore (Chong et al., 2014) Canada (Sontrop et al., 2008) . Two studies in USA although a high income country but the sample belonged to lower class (Fowles et al., 2011) and middle class women (Carter et al., 2000) . Three studies were from low income countries, out of which two were from Pakistan and one from India. Prevalence of both the factors under study, perinatal depression and nutritional deficiency is high in low income countries which has been demonstrated in these studies .A cohort study in Pakistan(Saeed et al., 2016a) found that prenatal depression increased the risk of poor HEI and the intake of all macronutrients is below the recommended in these women . The cross sectional study found that the mean dietary intake of calcium, iron, vitamin B3 and food variety score (FVS) were lower in distressed women .The Indian study however could not demonstrate any association of nutrients with prenatal depression.

Studies from the high income countries are focusing on the association of dietary patterns, behaviors and intake of specific nutrients like vitamin B12, Folate etc. or specific food items like oily fish. These studies found association of perinatal depression with dietary patterns like healthy, health conscious and Brazilian diets. Recently, research interest has shifted toward study of the potential interaction between mental disorders and dietary patterns, which represent a broader framework of usual dietary habits.

This study investigated the effect of past depression, past and current eating disorders (ED) on perinatal anxiety and depression which was marked in the group with pregnancy ED and symptoms and past depression (Micali et al., 2011) . Another study in

high income country setup describes associations between body mass index (BMI; kg/m2), eating attitudes, and affective symptoms across pregnancy and the postpartum period .Results of this study show that eating attitudes and BMI in pregnancy predicted postpartum depressive symptoms(Carter et al., 2000).

Most of the studies had large sample size to explain the association of depression with dietary measures.

8.7 Strengths and Limitations

Our systematic review consists of fourteen studies elucidating the association of perinatal depression with dietary intake of women. The selected studies are based on broad inclusion criteria and cover a wide range of depression and dietary measurements and spread over prenatal and postnatal periods. Research shows that prenatal depression is prevalent as well as is a risk factor for postnatal depression; hence both time periods are covered in our review.

Due to the diversity of studies we grouped them into those which focus on all nutrients, micronutrients, dietary patterns, dietary behaviors and oily fish for review purposes. This gives an in depth understanding of the relationship of maternal depression with not only whole or specific nutrients in diet but also into the dietary patterns and behaviors. Previous studies of the association between diet and depressive illness focused on individual nutrients or food groups However, nutrients and foods may have synergistic and inhibitory properties that may attenuate the relationship between isolated nutrients and health outcomes(Jacka et al., 2013). We have included studies on diet patterns in our review as recently research interest has shifted toward study of the potential interaction between mental disorders and dietary patterns.

One of the limitations of the study is absence of meta-analysis which was not possible due to heterogeneity of the studies included in review. However this review is comprehensive enough and taken into consideration a phenomenon which is still not well researched.

Our review had all observational studies and none were RCTs, as the trials in this area usually consist of short follow-up periods, small sample sizes, a single nutrient intervention being studied, and homogeneous samples that do not include pregnant

women. We were still able to see relationship of perinatal depression with diet in cohort and longitudinal studies in our review. Most of the studies in our review were cross sectional a design which prevents conclusive inferences about the direction of association between diet and perinatal depression and is subject to reverse causation.

Although most of the studies have provided information on potential social and environmental factors that are associated with the risk of perinatal depression, there may be other factors linked with both depression and diet during pregnancy that could explain this association.

8.8 Conclusion

Previously studies focused on individual nutrients and food groups when exploring association between depression and diet. Considering diets and dietary patterns, however, better reflects the results from cumulative food consumption. More holistic approaches to exposure and outcome measurement may therefore be useful approach in future epidemiological studies. This review was not able to show any conclusive association of maternal depression with dietary intake, yet it has contributed as guidance for future research. Longitudinal studies in countries where both problems are prevalent will produce significant evidence and also take care of the reverse causality which is a feature of cross sectional studies.

CHAPTER 9

AIM AND OBJECTIVES

9.1 Aim

The present research is aimed at determining the prevalence of prenatal depression and exploring the relationship of prenatal depression and its risk factors with the dietary intake in a representative population of women living in rural setting of Pakistan.

9.2 Objectives

1. To assess and compare the consumption of food groups and nutrients among depressed and non-depressed pregnant women living in Kallar Syedan, sub-district of Rawalpindi, Pakistan.
2. To determine the association of prenatal depression with dietary intake of women living in Kallar Syedan, sub-district of Rawalpindi, Pakistan.
3. To determine the association of socio-economic, demographic variables, social support, decision-making, stressful life events and intimate partner violence with dietary intake of women living in Kallar Syedan, sub-district of Rawalpindi, Pakistan.

9.3 Hypotheses

Null Hypothesis 1: There is no association of prenatal depression with inadequate dietary intake in women living in Kallar Syedan, sub-district of Rawalpindi, Pakistan.

Research Hypothesis 1: There is an association of prenatal depression with inadequate dietary intake in women living in Kallar Syedan, sub-district of Rawalpindi, Pakistan.

Null Hypothesis 2: There is no association of stressful life events, perceived and available social support, decision-making and Intimate Partner Violence with inadequate dietary intake of women living in Kallar Syedan, sub-district of Rawalpindi, Pakistan.

Research Hypothesis 2: There is an association of stressful life events, perceived and available social support, decision-making and Intimate Partner Violence with inadequate dietary intake of women living in Kallar Syedan, sub-district of Rawalpindi, Pakistan.

CHAPTER 10

METHODOLOGY

10.1 Introduction

This chapter describes instruments used for dietary assessment of pregnant women, its validation and adaptation for this study. In the end, the methods of statistical analysis adopted for this study are also described.

The details regarding study site, eligible study population, choice of study design and the instruments for assessment of prenatal depression have been discussed in Chapter 4. The description of all the independent variables has also been presented in Chapter 4.

10.2 Dietary Assessment Methods

Choosing the most suitable dietary assessment method for addressing a research question requires vigilant consideration. The primary research question must be clearly stated, while the questions of secondary importance should also be recognized. Choosing the most appropriate dietary assessment tool for the study depends on multiple factors (Thompson and Subar, 2013) for which one must take into consideration the following questions: (1) Is information required about foods, nutrients, other food components, or specific dietary behaviors? (2) Is the emphasis of the research question on finding food intakes using estimates of average intake, and does it also require distributional information? (3) Is the target of the research question on exploring the link between diet and health outcomes? (Thompson and Subar, 2013).

As the main target of this study was to explore the association of prenatal depression with dietary intake, literature from Thompson et al (Thompson and Subar, 2008) has been reviewed which focuses on an individual-level of food intake assessment method, and is intended to serve as a resource to describe the intakes of a population, using individual measurements for group-level analysis (EDITION, 2013). Table 36 below describes the various methods of dietary assessment:

Table 36: Dietary Assessment Methods

METHOD	DESCRIPTION
Retrospective Method	
24-Hour recall	The study participants are interviewed, either in person or by phone, regarding all types of food ingested in the last 24 hours, starting with the food taken just ahead of the interview. Various tools are used to make a rough estimation of the portion sizes.
Food frequency questionnaire	The participants are provided with an existing list of food items so that they are able to choose the food items they consume and how often do they consume them. However, nutritional value cannot be measured by this questionnaire.
Semi-quantitative Food frequency questionnaire	This differs from FFQ as it specifies the serving sizes; commonly used foods are selected and important sources of nutrients are incorporated to make the questionnaire valid.
Burke-type dietary history	Firstly, the study participants describe all types of foods they usually ingest and then interviewer asks about its quantity and frequency. Extra information can also be taken in this regards by food diaries, mind full inquiries and various other methods.
Prospective Method	
Weighed food record	In this method, the participant weighs all food and drinks ingested instead of just a rough calculation.
Electronic record (food recording electronic device FRED)	The participants record everything they eat on a special electronic recording device.
Duplicate portion analysis	A duplicate portion of the foods and beverages ingested by an individual is collected; foods are then chemically analyzed to obtain a direct nutrient analysis.

Food records, 24-hour recalls and food-frequency questionnaires (FFQs) are most common to estimate dietary intake in epidemiological research. Each method is characterized by a number of strengths and limitations which need to be considered when choosing a tool for dietary data collection(Margetts and Nelson, 1997) .

10.2.1 Selected Dietary Methods

For this study the tools selected for measurement of dietary intake include: -

1. Food Frequency Questionnaire
2. Twenty-four hour (24 hr.) dietary recall

Over the years epidemiologists and other medical researchers have been extremely interested about how diet affects health and disease but the major barrier to research on nutritional causes of disease is the ambiguity regarding the validity of existing dietary assessment methods and the consequent uncertainty about the results obtained. (Block, 1982)

In many epidemiologic and clinical researches, a method is needed that is valid at the individual level, and is easier and less costly to administer. Therefore, many researchers have designed and validated food frequency questionnaires. The literature reviewed below will provide a brief account of the validation and use of FFQ globally as well as in Pakistan.

10.2.2 Food Frequency Questionnaire (FFQ)

Food Frequency Questionnaires are usually the most reasonable instruments for practical and economic considerations. The most widely used FFQs are the Block (Block et al., 1986), Willett (Willett et al., 1985) and more recently, the National Cancer Institute (NCI) Diet History Questionnaire (DHQ) (Subar et al., 2000). This dietary assessment tool is generally used for epidemiologic research of chronic diseases in order to illustrate the dietary intakes of study participants at individual level. Such questionnaires are engaging since these are meant to assess usual or long-term intake, which is a more relevant determinant of chronic disease than are actual measures of recent diet. Moreover, they may be self-administered and processed at low cost for large study populations. All these have been developed for US populations but the Canadian researchers conducting large dietary studies also relied on these.

10.2.3 Validation of FFQ for Non-Pregnant Population

Block et al developed a self-administered diet history questionnaire for epidemiologic and clinical use. The food list and the nutrient values linked with it were developed using dietary data from 11,658 adult respondents who were part of the Second National Health and Nutrition Examination Survey (NHANES II) (Block et al., 1986).

Willett et al from 1979 onwards, developed and tested several FFQ for collection of dietary intake data (Willett et al., 1985). The initial version, had 61 food items, was tested among female nurses and was shown to provide reasonable measures of nutrient

and food intake compared with four week diet records. Another nutrient questionnaire, developed and tested by Willet, consisted of 131 food items. This 131-item FFQ was evaluated in comparison with two-week diet records in a population of male health professionals; the validity of most nutrient intakes improved with the increased number of foods. In another analysis, same researchers then measured the reproducibility and validity of the food intake measurements of this expanded questionnaire in the same population of men who were participants in the health professionals follow-up study (Willett et al., 1985).

Canadian nutritionists and epidemiologists observed that though there were similarities in Canadian and US dietary habits, some differences in food availability and nutrient fortification still existed (Association, 2003). Food frequency questionnaires designed for the USA may, therefore, not provide the accurate estimates of dietary intake in Canadian populations (Association, 2003). Hence, IIona Csizmadi and colleagues undertook to review and modify the National Cancer Institute's Diet History Questionnaire (DHQ) and its nutrient database. Results revealed the errors in nutrient intake estimates due to differences in food fortification between the USA and Canada. Hence it was concluded that errors in nutrient intake estimates can be minimized in Canadian populations by using nutrient databases that reflect Canadian fortification practices (Csizmadi et al., 2007).

A study was conducted by Romaina and colleagues to refine and validate a FFQ for a south Indian population for macro and micronutrient intake, which was developed and used in Prospective Urban Rural Epidemiological Study (PURE)(Iqbal et al., 2009). It was a large, ongoing, prospective cohort study being conducted worldwide to investigate societal and individual determinants, including diet, of chronic conditions such as obesity and Cardiovascular disease (CVD). As a result, this study was able to refine a FFQ that overestimated nutrient intake in an ongoing study in a developing country to a possible extent. Potential sources of error in the estimation of nutrient intakes, included verifying the food composition table, recipes and data entry were accurate. To eliminate double counting by systematically shortening the FFQ was undertaken by regression analyses. The previous quantitative FFQ was reformatted into a semi-quantitative instrument (Iqbal et al., 2009).

A study was undertaken about the dietary patterns of Pakistani adult population and its link with socio-demographic, anthropometric and life-style factors using a thirty-three-item FFQ (Safdar et al., 2013). It was developed by Safdar and colleagues based on the most frequently used Harvard FFQ format. It was adapted for this study after review of the available literature and information gathered through an informal dietary survey to reflect the underlying dietary habits of the low-income population in Pakistan. Data for the study was collected in 2004 as component of the Control of Blood Pressure and Risk Attenuation (COBRA) study. In this cross-sectional study, three distinct dietary patterns were identified explaining approximately 20 % of the variance in food intake among adults who participated in the COBRA study. This study represents the low-income urban population in Pakistan (Safdar et al., 2013).

All the above studies validated the instruments for a non-pregnant population. The literature below presents the validation and adaptation of FFQ for pregnant women.

10.2.4 Validation and Adaptation of FFQ for Pregnant Women

The significance of good nutrition during pregnancy has long been appreciated throughout the world. Nutritional adequacy, including sufficient intake of calories and protein, is a major reason of weight gain during pregnancy (King, 2000). Maternal intake of carbohydrates and protein fatty acids, micronutrients and Vitamin C also have significant impact on fetal growth and perinatal outcomes (Prentice, 1991). Food frequency questionnaires (FFQs) have been considered important tools for assessing long-term dietary intake in epidemiologic research(Tucker, 2007, Forster et al., 2014). Some researchers have explored their reliability and validity among pregnant women. Previous studies focused on the validity of FFQs for assessing intakes of calories, protein and a small number of micronutrients during pregnancy, (Greeley et al., 1992, Suitor et al., 1989) whereas recent studies have covered a larger group of nutrients (De Vriese et al., 2001, Brown et al., 1996a). The results of these studies conclude that FFQs can be used to classify pregnant women according to their nutritional intake with a reasonable degree of accuracy, however, this may vary according to the population and the number of food items on the instrument. The study carried out by Suitor et al observed that less number

of food items were also good enough to determine dietary intake quite accurately (Suitor et al., 1989).

Greeley et. al, performed a study on 50 healthy pregnant women to examine the effectiveness of the self-administered modified Willett Food Frequency Questionnaire (mWFFQ) relative to duplicate 24-hour recall interviews as a dietary assessment tool during pregnancy (Greeley et al., 1992). It was found that mWFFQ provided showed higher kilocalorie and nutrient values than the 24-hour recall with the except for fat intake. Hence mWFFQ is a useful tool for assessing nutrient intake of different pregnant women groups (Greeley et al., 1992).

A study in Brazil verified the relative validity of FFQ previously used in pregnant women who availed the national health-care system in the municipality of Ribeira o Preto, Sao Paulo, Brazil, against the 24-hour instrument for estimating nutrient intakes over the three trimesters of pregnancy (Selem et al., 2014). It was intended that this FFQ will subsequently be employed in assessing the relationship between dietary intake at the beginning of the pregnancy and the occurrence of gestational diabetes mellitus. The authors observed that there is lack of specific FFQs developed and validated for Brazilian pregnant women. The evidence of relationship between maternal dietary intake in pregnancy and fetal outcomes was necessary to assess the accuracy of the method for estimating intakes of nutrients throughout the pregnancy period. Therefore, the reference periods adopted for assessing food intake in this study were the first 6 months of pregnancy plus the pregnancy period as a whole. The FFQ showed acceptable accuracy for estimating micronutrients, fiber, Vitamin A, thiamin, riboflavin, niacin, Vitamin C and folic acid for the first two trimesters of pregnancy (Selem et al., 2014). In another study, a high proportion of study participants (70 %) were categorized into the same or adjacent quartiles for estimated energy, carbohydrate, micronutrients, cholesterol, vitamins and folic acid in both trimesters (Barbieri et al., 2013).

In a study involving Finnish pregnant women, Erkkola et al., assessed the nutrient intakes measured by an FFQ to be 30–40% higher than mean values which were calculated using food records (Erkkola et al., 2001).

Another study was carried out to further multiply the validity of the Harvard Service FFQ (HSFFQ) for use in the assessment of relative dietary intake among low-income American Indian and Caucasian pregnant women (Baer et al., 2005).

A study was undertaken across eight states of US to design and administer FFQ to clarify 24-hour dietary recall of pregnant and lactating women of Caribbean and African descendants (Forsythe and Gage, 1994). In this multicultural FFQ the pregnancy care teams asked subjects to remember what they have eaten and then adjusting the food recall for lapse in details related to portion size, product name, food combination and ethnic uniqueness. The results reflect that FFQ remained stable for 29 of the 30 variables studies and over different time periods (Forsythe and Gage, 1994).

A study conducted in India by Alok Sachan and colleagues determined the prevalence of Vitamin D deficiency in pregnant women and their newborns in northern India. They calculated the daily intake of dietary calcium and Vitamin D from a food-frequency questionnaire and were validated for calcium in a sample of 30 subjects against a 5-day diet record (D Pandey, unpublished observations, 2004). A strong correlation of dietary calcium estimation was observed between the food-frequency questionnaire and the diet record (r _ 0.653, P _ 0.001) (Sachan et al., 2005).

10.2.5 Adaptation of Food Frequency Questionnaire

For the purposes of this study, the following definition of a food-frequency questionnaire (FFQ) was used. “A questionnaire in which the respondent is presented with a list of foods and is required to say how often each is eaten in broad terms such as x times per day/per week/per month”. Various steps involved in development, adaptation and utilization of an FFQ are discussed in the section below.

10.2.6 Modification and Adaptation of an Existing Questionnaire

Questionnaires may either be developed from basic principles or adapted from existing questionnaires. In this study adaptation of an existing FFQ was done

Where time and finances are limited, the use of a preexisting questionnaire is particularly useful. Modification of an existing FFQ is a simpler and faster method than developing a questionnaire from conception. The questionnaire may have been developed

many years ago and thus may not cover all commonly eaten foods today. Hence, the original purpose of this questionnaire had to be considered. Who was the target population? When was the questionnaire developed? Whether a previous validation has been done and is acceptable? Literature review regarding development and validation of studies was done to check whether the original objective of the questionnaire met the requirements of this study or not. Available review of literature is given in section 8.1 above. Two published studies from South India and Pakistan have validated FFQ for adult population, (Iqbal et al., 2009, Safdar et al., 2013) but not for pregnant women. The questionnaires which have been modified and adapted for this study is the one validated for pregnant women and was used in National Nutritional Survey of Pakistan in 2011(NNS 2011) ((Bhutta et al., 2011).

This questionnaire from NNS has been simplified by keeping close-ended questions and an option of "other" to add any other food consumed which was not listed. The data of this study has been collected electronically on tablets at the baseline of a large trial.

10.2.7 Selection of the Food List

Development of the food list is a key to the success of a food-frequency questionnaire. For a food item to either contribute to absolute intake or to differentiate between individuals, it must be eaten reasonably often by a significant number of the population and contain a substantial amount of the nutrient/food group of interest. Also, the use of the food under study must vary from person to person (Bodnar and Siega-Riz, 2002).

The "Food Frequency Questionnaire" (FFQ) used in National Nutrition Survey, Pakistan; (NNS 2011) was modified and used. It covers all the commonly eaten foods by the Pakistani population. For this study, the Pakistani food basket and food composition tables were also consulted (Hussain, 2001) and finally the food list was prepared which comprised of items from following food groups: cereals (wheat nan, chapatti, Rice paratha (fried pancake), bread, corn-bread), meat (beef, mutton, chicken, fish, organ meat), egg, milk and milk products (fresh milk, yogurt or buttermilk, cheese), fresh fruits, fat or oil, vegetables.

10.2.8 Number of Food Items

The number of foods included has to be considered along with the validity and reproducibility of the questionnaire. Whenever an estimate of dietary data is required, short food-frequency questionnaires are considered to be sufficient if it measures dietary intake to the required accuracy (CUMMINGS et al., 1987). The purpose of FFQ in this study was to obtain an estimate of total intakes of commonly consumed food items, from the Pakistani food basket, over a designated time period, among depressed and non-depressed pregnant women, to see if their food intake is affected by the presence of depression. Therefore, the list based on the Pakistani food basket is comprehensive for the research objectives. Willet et al, citing a study in which a 44 item list was compared with 273 items one, suggested that there is decreasing marginal gain in information obtained with increasingly detailed questionnaire (Willett et al., 1985).

10.2.9 Use of Individual Foods versus Groups of Foods

Obtaining precise reports for foods eaten both alone and in mixed dishes had been quite problematic. Food-frequency questionnaires may ask the respondent to report either a combined frequency for a particular food eaten alone and in mixed dishes or they may ask the respondent to report separate frequencies for foods eaten alone or in combination. The first approach is cognitively difficult for people who do not cook, but the second approach may lead to double counting and over estimation of intake (Cade et al., 2002). We have used the separate frequency approach. For mixed dishes we asked about the major ingredients used and entered them in relevant food group.

10.2.10 Frequency and Portion Size

As mentioned above, foods from various food groups are chosen for the purposes of this study and may assess total diet for the Pakistani population. The food frequency approach asks respondents to report their usual frequency of consumption of each food from a list of food items, for a specific time period. Information is collected on frequency, which was used to estimate the habitual dietary intake per day, week, or month preceding the pregnant women's interview. Many FFQs also incorporate portion size questions but this study did not include portion sizes.

10.2.11 Method of Administration

Questionnaires may be either interviewer-based or self-administered, depending upon the requirements of the study. One problem with self-administered food-frequency questionnaires is incomplete answers; some respondents complete the questionnaire for items they usually eat tending to ignore other items. The FFQ at the baseline of a large trial has been used. The baseline questionnaire in this study was interviewer administered as the respondents were mostly uneducated; probes were added to help respondent recall. An option of "any other food", for the items not included in the food list, was also added.

10.2.12 24-Hour Dietary Recall - Second Method of Dietary Assessment

In the 24-hour dietary recall, the respondent is asked to remember and report all the foods and beverages consumed in the preceding 24 hours or in the preceding day. The recall typically is performed by interview, in person or by telephone, either computer-assisted or using a paper-and-pencil form. The interview is often structured, usually with specific probes, to help the respondent remember all food items consumed throughout the day. An early study found that respondents with interviewer examining reported 25% higher dietary intakes than did respondents without interviewer probing (Campbell and Dodds, 1967). This method can be administered by persons with less training and in a shorter time. The subject is asked to recall his/her exact intake in last 24 hours. In this method, the memory of recent intake is involved more precise intake and quantities are estimated with accuracy. As the individual's diet vary from day to day and a single day's intake may not be representative (Morgan et al., 1978). The seven day recall method is more representative but the memories of intake fade in a day or two ,hence the loss in accuracy may exceed gain in representativeness (Block, 1982).

The current state-of-the-art 24-hour dietary recall instrument is the U.S. Department of Agriculture's (USDA) Automated Multiple-Pass Method (AMPM) which is used in the U.S. National Health and Nutrition Examination Survey (NHANES), this country's only nationally representative dietary survey.

Using one 24-hour recall period does not provide an indication of an individual's habitual diet, but it does provide an assessment of the diet at the population level and can be useful to monitor progress or target interventions (Savy et al., 2005). There are various

other valid time frames for recall, such as the previous 3 or 7 days, and in the case of some foods, the previous month. However 24 hour recall is less cumbersome for the respondent and also conforms to the recall time period used in many dietary diversity studies. Moreover, analysis of dietary diversity data based on a 24-hour recall period is easier than with longer recall periods (Savy et al., 2006, Kennedy et al., 2007).

10.2.13 Validation of 24-Hour Dietary Recall

Literature below gives an account of the validation of 24-hour recall method.

Validation means that a method measures what it is intended to measure i.e. the truth be known but for dietary intake it is a bit difficult. So the concept of relative validation is more useful. The 24-hour recall is more susceptible of direct validation as compared to other methods ,as the time covered is short ,so direct observation and measurement of intake are possible as well as practical (Block, 1982).

Madden et al. compared 24-hour recall with observed and weighed duplicate meals for 76 elderly persons who consumed an institutional lunch. The group mean values by the two methods were found to be similar for all nutrients except calories (Madden et al., 1976). Furthermore, while Madden et al. and other investigators have found significant underreporting of intake by the recall method (Stein et al., 1992, Kafatos et al., 1989) analysis of variance revealed a highly significant relationship between actual and recalled values for all nutrients.

Gibson (2008) developed the interactive dietary recall method to fill the need for a rapid, non-invasive dietary tool, one with a low respondent burden and the ability to quantify daily intakes in developing countries. This new method can assess actual or usual intakes for an individual or a group. Consequently, prevalence estimates for inadequate within the study group could be done without the need to collect biological samples, such as blood which is culturally unacceptable to rural populations in developing countries (Gibson and Ferguson, 2008). This interactive 24-hour recall was focused and was validated for the average intakes of iron and zinc only.

10.2.14 Adaptation of 24-hour Recall Questionnaire

The 24-hour recall questionnaire has been adapted from the one used in the National Nutrition Survey, (NNS 2011 Pakistan). It is validated for pregnant Pakistani women. Structuring of the food list was done at 7 points in time during the last 24-hours, (after wakeup, breakfast, In between breakfast and lunch, lunch, in between lunch and dinner, dinner and after dinner, and before going to bed). The food list is based on items from the Pakistani food basket.

10.2.15 Method of Administration

While collecting data for 24-hour recall, interviewers prompt a respondent to recall and describe all foods and beverages being consumed over the past 24 hours at each point in time without interruption. They record the items from the list. Specific probes help the respondent to remember all of the foods eaten. Probing questions are asked for more detailed information about the food and the portion size, in addition to review of the eating occasions Probing is useful in collecting details on different foods and also for recovering foods that are forgotten (e.g., butter on toast) or in retrieving eating occasions not originally reported by respondents like snacks or tea breaks. The final review, in which any other item not already reported, was then taken.

10.2.16 Estimation of Portion Size

Research has shown that untrained individuals have difficulty in estimating portion sizes of foods, both when examining displayed foods and when reporting about foods previously consumed (Frobisher and Maxwell, 2003, Baranowski et al., 2011). One study indicates that literacy, but not numeracy, is an important factor in an individual's ability to accurately estimate portions size (Huizinga et al., 2009). Portion sizes of foods that are commonly bought and/or consumed in defined units (e.g., bread by the slice, pieces of fruit, and beverages in cans or bottles) may be more easily reported than amorphous foods (e.g., steak, lettuce, and pasta) or poured liquids. Small portion sizes tend to be overestimated and large portion sizes underestimated (Subar et al., 2010).

Aids are commonly used to help respondents estimate portion size. In NHANES, an extensive set of three-dimensional models for an initial in-person 24-hour dietary recall were used ,respondents were then given a Food model Booklet developed by the USDA

(Thompson and Subar, 2008) along with a limited number of three-dimensional models (e.g., measuring cups and spoons) for recalls collected by telephone. The accuracy of reporting using either models or household measures can be improved with training ,but the effects deteriorate with time (Bolland et al., 1990). Studies that have compared three-dimensional food models to two-dimensional photographs in adults have shown that there is little difference in the reporting accuracy between methods.

Gladys Block, in a review of methods of validation of dietary assessment methods commented that "rather than focusing on a method's ability to yield accurate and precise numbers of milligrams of a nutrient, it may be important to produce and evaluate a method to place individuals into broad categories along the distribution of intake from very little to very much" (Block, 1982). It has been concluded from the review above that in epidemiological studies of relationship between diet and disease, precise and accurate quantitative amounts which are the dream of nutritionists may not be necessary. Many questions are answerable with crude instruments.

In this study, the assessors were well educated and well trained to pose the questions for 24-hour recall and probes. For estimation of portion they asked the respondents to show which utensils they use, for example cups, glass, plates, spoons, bowls etc. In the pilot phase the usual sizes of utensils used in the study area were noted. Hence an estimate of distribution of respondent's intake was achieved.

10.3 Measures to Estimate Portions of Commonly Eaten Foods

10.3.1 Portion Size of the Foods Consumed

In all dietary assessment methods, where food is not weighed, portion sizes must be applied before nutrient output can be calculated. There are a number of methods by which portion sizes may be obtained. These may include field workers weighing certain food items on the individual's behalf, the use of photographic atlases (e.g. Nelson et al., 1997) showing portion sizes of commonly eaten foods, data from manufacturers, portion sizes collected from previous weighed food records, and household measures (Nelson et al., 1997)

In this study utensils like plates, glasses, cups and spoons were obtained from the randomly selected 10 households from the community and the portions were decided by

weighing the amount of food they hold and the volume of the liquid containers was measured by using standard measuring beakers. In this way, a list of all types of utensils along with their volumes was prepared. These measurements were then divided into three groups and categorized into small, medium and large categories based on the particular range of measurement. See Table 37-44 for measurement of few items of food.

Commonly eaten foods for example chappati (flat bread), rice, vegetables, meat, lentils, and snacks such as French fries, crisps and biscuits were measured in grams and milk, tea and juice in milliliters.

Table 37: Rice portion sizes (wt. in grams)

Food	Wt. of plate	Plate and food	Food only
Rice (large)	500	1100	600
Rice(Medium)	500	900	400
Rice (small)	500	700	200

Table 37a Chapatti sizes (wt. in grams)

Food	Wt. by size.
Chapatti large	150
Chapatti medium	100
Chapatti small	50

Table 38: Mincemeat curry (wt. in grams)

Food	Wt. of plate	Plate and food	Food only
Mince (large)	250	500	250
Mince(Medium)	250	400	150
Mince(small)	250	300	50

Table 39: Chicken Curry/Karahi (wt. in grams)

Food	Wt of plate	Plate and food	Food only
Chicken Curry/Karahi (large)	250	500	250
Chicken Curry/Karahi (Medium)	250	400	150
Chicken Curry/Karahi (small)	250	300	50

Table 40: French fries (wt. in grams)

Food	Wt. of plate	Plate and food	Food only
French fries (large)	200	450	250
French fries (Medium)	200	400	200
French fries (small)	200	350	150

Table 41: Noodles/spaghetti (wt. in grams)

Food	Wt. of plate	Plate and food	Food only
Noodles (large)	500	1100	600
Noodles (medium)	500	950	450
Noodles (small)	500	800	300

Table 42: Vegetables (wt. in grams)

Food	**Wt. of plate**	**Plate and food**	**Food only**
Mixed vegetable (large)	250	500	250
Mixed vegetable (Mediun	250	400	150
Mixed vegetable (small)	250	300	50

Table 43: Lentils (wt. in grams)

Food	Wt. of plate	Plate and food	Food only
lentils (large)	250	550	300
lentils(Medium)	250	450	200
lentils(small)	250	350	100

Table 44: Milk/ beverages (ml)

Food	Amount in ml
Milk (large)	200
Milk(medium)	150
Milk (Small)	125

10.4 Choice of Cross-Sectional study Design for Assessment of Dietary Intake

Cross-sectional is one of the most common types of population-level study design(Yu and Tse, 2012) In this design a set of measurements of a population at a particular point in time is captured (Safdar et al., 2013). Such type of data can describe the intake of a particular population. The dietary data collected in cross sectional studies can be used for surveillance as the basis for assessing risk of deficiency, toxicity, and overconsumption; to evaluate adherence to dietary guidelines and public health programs; and to develop food and nutrition policy. It can also be used to examine the association between current diet and other health related factors (Der Marderosian, 1993). Any of the dietary assessment methods discussed above (in section 8.1) can be used for cross-sectional studies. The 24-hour recall is appropriate when the study purpose requires quantitative estimates of intake. Others, such as FFQs or behavioral indicators, are appropriate when qualitative estimates are sufficient for example frequency of consuming specific type of food (Coulston and Boushey, 2008).

10.5 Analysis of Dietary Intake Data

10.5.1 Variables in the Study

Independent variables have been discussed in Chapter 4.

Outcome Variable is adequate dietary intake defined as adequate micro and macronutrient to satisfy the body requirement based on food variety scores which reflects the number of different food items consumed over a week. FVS is a simple measure of dietary quality and household access to a diversity of food.

Food Variety Score (FVS)

For the purpose of generation FVS, some food items of similar nutritional quality were grouped as a single food type. Food items selected for FVS included cereals (wheat nan, chapatti, paratha (fried pancake), bread, corn-bread), meat (beef, mutton, chicken, fish, organ meat), egg, milk and milk products (fresh milk, yogurt or buttermilk, cheese), fresh fruits, fat or oil, vegetables. Scores were assigned based on frequency of selected food items per week; daily intake: 7, 6 down to 1 times per week and < 1 time per week: 0. The FVS was calculated by summing the frequency scores of the seven selected food items FVS was dichotomized at the median value to generate 'adequate or inadequate dietary intake.

10.6 Statistical Analysis

10.6.1 Descriptive and Univariate Analysis of Dietary Intake Variables

Data was collected by modifying FFQ and 24-hour food recall method. FFQ was used to obtain the consumption of various food items on daily, weekly, and monthly basis. For analysis data was entered in MS Excel. The food item which was reported as consumed per week or month, intake was calculated on a daily basis for each. After that, consumption of food groups was calculated by adding different food items according to the USDA food pyramid guidelines (http://www.cnpp.usda.gov/food-guide-pyramid-print-materials). The results obtained for each group then compared with the standards to know whether the intake of various food groups was according to the standards or not. The significance of the results was confirmed by applying the t-test. The data was then divided according to depressed and non-depressed participants and results were compared between the two groups.

Data collected by the 24-hour food recall method was used to access the frequency of meal intake per day. It was also used to access the macro and micro nutrient consumption of the participants. For that Nutri-survey software was used (Erhardt, 2014).

All food items a person consumed per day was entered and by selecting the portions of servings and the estimated energy and other nutrient intake of that individual was obtained. The same procedure was applied to all individuals. The obtained results were then entered in the SPSS and compared with the Recommended Dietary Allowance (RDA) (Allowances, 1989) to see whether the nutrient intake in the selected population was adequate or not. The results were then categorized according to depression status and comparison was made between the two groups.

10.6.2 Multivariate Analysis

Ordinary linear regression predicts the expected value of the outcome variable as a linear combination of a set of predictor factors. The data type of outcome in the ordinary least square is continuous; several models exist depending over the data type of outcome variable. These models are gathered under the title of generalized linear model (Hastie and Tibshirani, 1990) which can:

- Continuous outcome through linear link function, known as multiple linear regression
- Categorical outcome through logit link function, known as multiple logistic regression
- Count outcome through log link function, known as multiple poison regression

Analysis of data where primary endpoint is a binary variable can be analyzed using a generalized linear model (Madsen and Thyregod, 2010) with logit link function.

As in this study, the primary endpoint is a binary variable (Dietary inadequacy). It was analyzed using GLM with logit link function. The odds ratio between the two groups with and without dietary inadequacy along with 95% confidence interval were derived from the model. Factors such as socio-demographic, maternal, family and economic characteristics, MSPSS, empowerment, stressful life events, autonomy, MSSI, and IPV were considered in the GLM model. The collinear factors were removed from the model. Since the model may include some statistically insignificant factors which were supposed

to be eliminated from the model, so a backward stepwise GLM model selection was carried out. This is an iterative procedure where at each step we removed the insignificant factors by using a ‘p’ value threshold of 0.2 and if a removed factor appeared significant in next iteration it was included. This model building process continued until we were ensured that the model contains the significant factors and is well fitted based on likelihood ratios. In model fitting the multi-collinearity of factors was tested through variance inflation factor (VIF) (Farrar and Glauber, 1967, Wichers, 1975).

CHAPTER 11

RESULTS: DIETARY INTAKE OF PREGNANT WOMEN

11.1 Introduction

Diet is usually described in terms of its nutrient contents; however the use of specific food groups can also describe the diet. In this study the two most common methods of assessing dietary intake were used; food frequency questionnaire for the past one month's intake and 24-hour recall for current dietary intake. The chapter is organized in such a way to show first the frequency of the items which constitute various food groups as shown in Tables 1-6 based on the food frequency questionnaire. Next the frequency of food groups is shown and compared to food guidelines according to the food pyramid. In the next section meal consumption at various points in time is shown based on 24-hour recall and the intake is compared between depressed and non-depressed women. Further the intake of nutrients and association with prenatal depression is shown. The analysis is divided into two or three sections: i) descriptive analysis of consumptions of items from different food groups and nutrients, ii) univariate analysis to assess difference in the consumption among depressed and non-depressed, iii) the relationship of dietary inadequacy with socioeconomic and demographic variables as well as stressful life events, perceived and available social support, decision-making and IPV, and iv) a GLM model to show the association of food inadequacy with prenatal depression and its risk factors.

11.2 Frequency of Intake Based on Ingredients from Food Groups

Chappati/paratha is made from wheat and is consumed daily by all the participants as it is the staple food in the area. Around 79% participants used pulses and 71.8% used rice weekly. Consumption of bread and maize was low in the group; around 10% consumed them on a monthly basis only.

Table 45: Consumption of grains

Food item	Daily		Weekly		Monthly	
	N	%	N	%	N	%
Bread	11	2.2	53	10.6	55	11
Rusk	27	5.4	64	12.8	70	14
Roti/Nan/Paratha	500	100	-	-	-	-
Rice	11	2.2	359	71.8	95	19
Maize	1	0.2	25	5	46	9.2
Pulses	26	5.2	395	79	43	8.6

Most of the participants, 75.2% used vegetables on weekly basis, whereas daily consumption was only by 21.2% women.

More than half of the respondents, 52.2% ate fruits daily as shown in Table 47.

Table 46: Frequency of intake of vegetables and fruits group

Food item	Daily		Weekly		Monthly	
	N	%	N	%	N	%
Vegetables	106	21.2	376	75.2	8	1.6
Fruits	261	52.2	150	30	79	15

Table 48 shows that red meat including mutton or beef was consumed weekly by a quarter of (n=130) of women and the organ meat was consumed by less than one-fifth of women and that was also on monthly basis.

Chicken was used by more than half (54.6%) & and egg by 35% of women weekly, whereas fish intake was very less and was consumed by less than a quarter of women (16.2%) on monthly basis only.

Table 47: Frequency of meat and egg group

Food item	Daily		Weekly		Monthly	
	N	%	N	%	N	%
Red meat						
Mutton/Beaf	9	1.8	130	26	32	6.4
Organ meat	3	0.6	45	9	89	17.8
White Meat & egg						
Chicken	13	2.6	273	54.6	93	18.6
Fish	1	0.2	18	3.6	81	16.2
Egg	93	18.6	175	35	29	5.8

Milk was mostly consumed daily by 43.6% women followed by weekly consumption of yogurt by a quarter of women (25.6%). Overall use of cheese or butter was very low and only less than 10% took cheese /butter on weekly basis.

Table 48: Table 49: Consumption of milk and milk products

Food item	Daily		Weekly		Monthly	
	N	%	N	%	N	%
Milk	218	43.6	59	11.8	10	2
Yogurt	37	7.4	128	25.6	35	7
Cheese/Butter	37	7.4	45	9	5	1
Oil and ghee	487	97.4	13	2.6	-	-

Table 49 also shows that oil/ghee was consumed by almost all women 97.4% on daily basis as oil or ghee is used in daily cooking of almost all food in this area.

11.3 Recommended Frequency of food items by food groups for pregnant women

Institute of Medicine (IOM) recommends an optimal pattern of healthy diet as three meals and two or more snacks per day. The Food Guide Pyramid for pregnancy, developed by the United State Department of Agriculture (USDA), is an excellent tool to make healthy food choices. According to this pyramid tool 6–11 servings of grains, 3–5 servings of vegetables, 2–4 servings of fruits, 2–3 servings of protein and dairy each, and sparingly use of fats is required to fulfil the daily optimal need of nutrients (Gao et al., 2006).

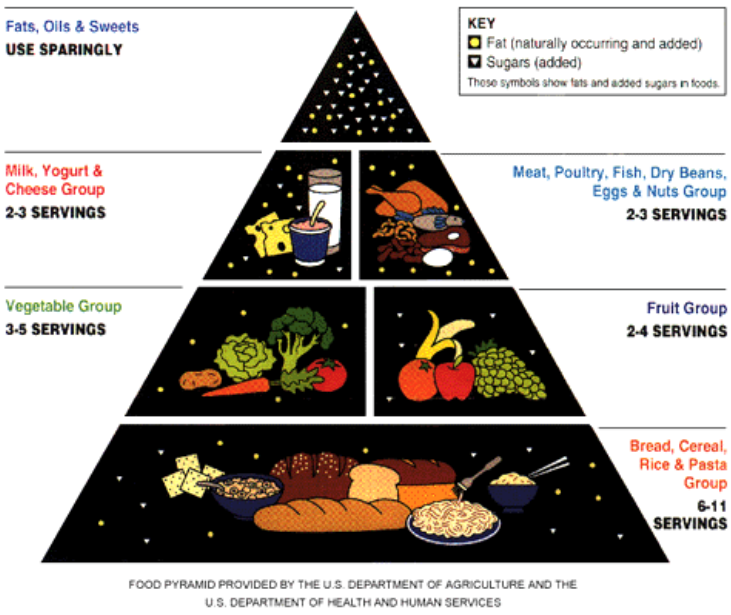

Figure 17: USDA Recommended frequency of food items for pregnant women (Gao et al., 2006)

11.4 Daily Consumption of Food Groups

Table 50 shows daily consumption of food. Daily dietary intake has two categories (adequate consumption and inadequate consumption). Almost all (97%) of pregnant women were not taking the recommended 6-11 servings of grains per day which meant that their daily grains intake was inadequate. The mean servings were 3.47(±0.91).

Similarly, consumption of vegetables, poultry, meat and fish was also inadequate in more than 90% of the respondents and the mean intake was less than 1 serving per day. The majority of women (83.3%) were not consuming dairy products adequately.

Only 22% of women took fruit according to the recommended 2-4 servings a day.

Table 50: Frequency of the daily consumption of food groups

Food groups with standard servings	Daily dietary consumption				consumption of food groups Mean (SD)
	Inadequate		Adequate		
	N	%	N	%	
Grains (6-11)	483	96.6	17	3.4	3.47 (0.91)
Vegetables (3-5)	476	95.2	24	4.8	0.7 (0.78)
Fruits (2-4)	390	78	110	22	0.90 (0.87)
Meat ,Poultry, fish (2-3)	455	91	45	09	0.66 (0.65)
Dairy (2-3)	419	83.8	81	16.2	0.80 (0.87)
Fats (Sparingly)	-		-		1.70(1.48)

11.4.1 Association of daily consumption of food groups with prenatal depression

Table 51 shows the daily servings of items from the food groups recommended in the food pyramid among the depressed and non-depressed women in univariate analysis. Over all most of the women (97%) were inadequately consuming i.e. less than 6 servings of grains mostly in the form of chappati or paratha. Only 3.4% were taking more than 6 servings which were recommended. Women who were taking >6 servings of grains were mostly non-depressed (81.2%) as compared to depressed women (18.8%) and a significant difference was found with a p-value <0.01.

Similarly, fruits, meat, milk and milk products were not consumed according to recommendations of > 2, overall by 78%, 91% and 83% women respectively.

There were 68.2% non-depressed and 31.8% depressed women, who were taking fruits $\geq$2 servings as per recommendations and this difference was highly significant with p-value of <0.001.

Similarly, significant difference was there in meat consumption according to recommendation of $\geq$ 2 servings, with 71.1% non-depressed and 28.9% depressed women and a p-value was <0.01

Table 51: Association of Daily Serving of Food group items with prenatal depression

Daily consumption of food groups		Non-Depressed		Depressed		p-value
Food Groups	**Servings**	**N**	**%**	**N**	**%**	
Grains	< 6 servings (inadequate)	241	49.9	242	50.1	0.009**
	≥6 servings (adequate)	14	81.2	3	18.8	
Vegetables	< 3 servings (inadequate)	244	51.3	232	48.7	0.60
	≥ 3 servings (adequate)	11	45.8	13	54.2	
Fruit	< 2 servings (inadequate)	180	46.2	210	53.8	<0.001***
	≥ 2servings (adequate)	75	68.2	35	31.8	
Meat	< 2 servings (inadequate)	223	40.0	232	60.0	<0.005**
	≥ 2 servings (adequate)	32	71.1	13	28.9	
Milk and products	< 2 servings (inadequate)	198	47.3	221	52.7	<0.001***
	≥ 2 servings (adequate)	57	70.4	24	29.6	

11.4.2 Association of distribution of daily meal consumption with prenatal depression

Table 52 shows frequency of daily meal consumption; overall and seven times by 24 hours food recall. Overall, most of the women 69% were taking four or more meals in a day. Among those 59.7% non-depressed while only 40.3% depressed women were consuming more than four meals. This difference was highly significant (p<0.001). Women who were taking less than 3 meals were more depressed (68.4%) than non-depressed (31.6%).

In 24-hour food recall, the respondents were asked to give the food items they consumed in previous 24 hours at seven points in time starting from after getting up in the

morning the previous day till they went to sleep. Most of the respondents (84%) did not eat/drink anything before breakfast. There were only 16% women who consumed food item at this time, among them 62.5% non-depressed and only 37.5% depressed women consumed food item and this difference found significant ($p<0.05$).

Most of the women (97%) had breakfast and there was no significant difference among the depressed and non-depressed women. Overall half of the women took a snack between breakfast and lunch and among them mostly were non-depressed (62.9%) than depressed (37.1%). This difference was highly significant with p-value <0.001.

Overall lunch and dinner were consumed by most (92%) and (90.8%) women respectively. About 25.6% non-depressed and 74.4% depressed women didn't eat lunch. Dinner was not taken by 30.4% non-depressed and 69.6% depressed women, the difference was highly significant with a p-value <0.001.

As far as snacks after lunch and dinner were concerned, most of the respondents 62.2% and 66% did not take respectively. There were 60.3% non-depressed and 39.7% depressed who took snack after lunch. After dinner 43.9% non-depressed and 56.1% depressed did not take a snack.

Table 52 shows that three main meals were preferred by both groups. However, there were more depressed women compared to non-depressed who did not take the main meals as well except breakfast. Snacks were not taken by most of the respondents. However women preferred to take snacks after breakfast as compared to after lunch or dinner.

Table 52: Association of distribution of daily meal consumption with prenatal depression

Meal	Intake	Total		Non-Depresse		Depressed		p-value
		N	%	N	%	N	%	
Frequency meal /day	≤3	155	31	49	31.6	106	68.4	<0.001***
	≥4	345	69	206	59.7	139	40.3	
Before breakfast	No	420	84	205	48.8	215	51.2	0.02*
	Yes	80	16	50	62.5	30	37.5	
Breakfast	No	14	2.8	6	42.9	8	57.1	0.53
	Yes	486	97.2	249	51.2	237	48.8	
After breakf	No	252	50.4	99	39.3	153	60.7	<0.001***
	Yes	248	49.6	156	62.9	92	37.1	
Lunch	No	39	7.8	10	25.6	29	74.4	<0.001***
	Yes	461	92.2	245	53.1	216	46.9	
After Lunch snack?	No	311	62.2	141	45.3	170	54.7	<0.001***
	Yes	189	37.8	114	60.3	75	39.7	
Dinner	No	46	9.2	14	30.4	32	69.6	0.003**
	Yes	454	90.8	241	53.1	213	46.9	
After dinner	No	330	66	145	43.9	185	56.1	<0.001***
	Yes	170	34	110	64.7	60	35.3	

11.5 Nutrient consumption

Nutrient consumption from food was assessed through 24-hour recall method and analyzed using Nutri-survey software. Table 53 shows the mean daily macronutrient consumption, which reveals that most of the women were taking less than recommended amount. Mean intake of all the macronutrients were less among depressed as compared to non-depressed women and the difference was statistically significant with a p-value of <0.001.

Table 53 shows that the mean intake of PUFA, Vitamin E and folic acid was significantly different between the depressed and non-depressed and this difference was significant with p-values of <0.05, <0.01and <0.01 respectively. Mean intake of vitamin in depressed women was less as compared to non-depressed.

The table gives the mean intake of minerals among the two groups of women. It can be seen that the mean intake among depressed was low for all minerals including calcium, iron and zinc, and this difference was significant.Mean Food variety score is

higher for non-depressed (24.1 ±3.6) as compared to depressed (20.2±4.0) and this difference was statistically significant.

Table 53: Association of nutrient consumption per day with prenatal depression

Nutrients	Total intake			Mean Difference	p-value
		Not Depressed Mean(SD)	Depressed Mean(SD)		
Energy (2510 Kcal)	1791(5.6)	1909(545)	1668(453)	240.68	<0.00***1
Protein (62g)	61.30(25.9)	66.75(26.8)	55.59(23.9)	11.16	<0.001***
Fat (69.1 g)	60.4(26.4)	63.26(28.4)	57.45(23.9)	5.81	<0.001***
Carbohydrates (290.7	247(74.6)	262.82(75)	230.49(71)	32.33	<0.001
PUFA (10g)	11.27(4.23)	11.74(4.6)	10.77(3.8)	0.976	0.007**
Vit. A (750ug)	800.3(515.6)	811(507)	789(525)	21.92	0.632
Vit. E (13mg)	7.13(2.56)	7.57(2.7)	6.67(2.2)	0.902	0.005**
Folic acid (600ug)	152(75.4)	160.8(79)	142.9(70)	17.86	0.008**
Vit. C (110mg)	85.74(62.8)	89.38(64)	81.92(62)	7.45	0.185
Calcium (1000mg)	341.7(178.9)	378(187)	304(162)	73.8	0.004**
Iron (40mg)	14.56(4.6)	15.30(4.7)	13.77(4.3)	1.52	0.001**
Zinc (20mg)	13.2(4.67)	14(4.8)	12.37(4.35)	1.63	0.001**
FVS	22 (3.8)	24.1 (3.6)	20.2 (4.0)	3.1	<0.001***

An adequate diet is one which is according to recommendations for daily requirements. The recommended daily allowance for the Pakistani population is available. Based on that, inadequacy of various macronutrients, micronutrients, vitamins and minerals were compared for depressed and non-depressed women.

Overall, the population was not consuming all the nutrients adequately. However, the intake of all macronutrients was lower in the depressed category as compared to the

non-depressed and the difference was statistically significant in case of energy, proteins and carbohydrates. In case of fat intake the difference was not significant with p-value > 0.05.

Similarly the micronutrients including vitamins and minerals were also consumed inadequately by majority of population and the proportion of women who were taking adequate intake of majority of micronutrients was lower in the depressed than non-depressed but this difference was not statistically significant (except in Vitamin E and Zinc intake with a p-value of <0.05 as shown in Table 54

Table 54: Daily nutrient consumption according to RDA and prenatal depression

Nutrients standards	Nutrient intake	Nutrient consumption per day				p-value
		Non-Depressed		Depressed		
		N	%	N	%	
Energy (2510 Kc	< RDA	229	49.5	234	50.5	<0.006**
	RDA	27	73	10	27	
Protein (62g)	< RDA	133	42.5	180	57.5	<0.001***
	RDA	123	65.8	64	34.2	
Fat (69.1 g)	< RDA	161	48.2	173	51.8	0.05
	RDA	95	57.2	71	42.8	
Carbohydrates	< RDA	183	47	206	53	<0.001***
(290.7g)	RDA	73	65.8	38	34.2	
PUFA (10g)	< RDA	95	47.3	106	52.7	0.171
	RDA	161	53.8	138	46.2	
Vit. A (750ug)	< RDA	120	48.6	127	51.4	0.283
	RDA	136	53.8	117	46.2	
Vit. E (13mg)	< RDA	243	50.2	241	49.8	0.020*
	RDA	13	81.2	3	18.8	
Folic acid (600ug	< RDA	256	51.2	244	48.8	-
	RDA	0		0		
Vit. C (110mg)	< RDA	187	50.1	186	49.9	0.472
	RDA	69	54.3	58	45.7	
Calcium (1000mg	< RDA	256	51.2	243	48.8	0.49
	RDA	0		1	100	
Iron (40mg)	< RDA	256	51.2	244	48.8	-
	RDA	256	51.2	244	48.8	
Zinc (20mg)	< RDA	226	49.6	230	50.4	0.026*
	RDA	30	68.2	14	31.8	

11.6 Dietary Inadequacy and its association with maternal characteristics

This section has been divided into maternal, family and socioeconomic factors. Table 55 summarizes associations of maternal characteristics with food inadequacy.

Prenatal depression was significantly associated with dietary inadequacy. Around 77% women having prenatal depression had inadequacy as compared to 55% non-depressed.

Maternal characteristics like education, depression, number of children and health in last 30 days were highly significant statistically with P values less than 0.01. Around three quarters of the women who had dietary inadequacies were uneducated and more than three quarter had more than four pregnancies and their health was bad or very bad in the last month. Number of pregnancies was found significantly associated with food inadequacy with p-value less than 0.05, more than three quarter who had six plus pregnancies had inadequate diet.

Table 55: Association of Dietary Inadequacy with maternal factors

Maternal Factors		Dietary Intake				p-value
		Inadequate		Adequate		
		N	%	N	%	
Depression	No	143	55.4	115	44.6	0.001**
	Yes	186	76.9	56	23.1	
Age category	15-22	56	61.5	35	38.5	0.635
	23-30	212	66.9	105	33.1	
	31+	61	66.3	31	33.7	
Wife Education	Uneducated	64	74.4	22	25.6	0.001**
	Primary/middle	144	73.8	51	26.2	
	Sec/H.Sec	99	61.5	62	38.5	
	Bachelor & above	22	37.9	36	62.1	
Mean BMI		25.0 SD 18.6		26.7 SD 7.9		0.168
BMI (Pre-pregnancy)	Underweight	80	67.8	38	32.2	0.808
	Normal	168	65.6	88	34.4	
	Overweight	66	66.0	34	34.0	
	Obese	15	57.7	11	42.3	
Infant Death	No	289	65.8	150	34.2	0.968
	Yes	40	65.6	21	34.4	
Child Mortality	No	284	65.7	148	34.3	0.944
	Yes	45	66.2	23	33.8	
Misc- miscarriages	No	229	63.8	130	36.2	0.130
	Yes	100	70.9	41	29.1	
No of children	0	88	58.7	62	41.3	0.008**
	1-3	199	66.6	100	33.4	
	4+	42	82.4	9	17.6	
Duration of pregnanc	2nd trimester (4-6	199	65.2	106	34.8	0.744
	3rd trimester (7-9	130	66.7	65	33.3	
Health in last 30 days	Very Good	13	44.8	16	55.2	0.001**
	Good	67	51.5	63	48.5	
	Moderate	139	70.6	58	29.4	
	Bad	76	73.8	27	26.2	
	Very bad	34	82.9	7	17.1	
Delivery Place	Hospital	193	69.2	86	30.8	0.074
	Home	49	68.1	23	31.9	
	Other	87	58.4	62	41.6	
Contraceptive plan	No	144	65.2	77	34.8	0.788
	Yes	185	66.3	94	33.7	
No of Pregnancies	<3	200	61.5	125	38.5	0.021*
	4 to 6	105	72.9	39	27.1	
	>6	24	77.4	7	22.6	

11.7 Dietary Inadequacy and its association with family characteristics

Table 56 below shows that several family characteristics were significantly associated with food inadequacy. Dietary inadequacy was more prevalent among manual workers (73.5%) as compared to non-manual workers (60.9%), in those who were not satisfied (88%) or moderately satisfied (70.6%) with their life at present than those who were satisfied (57.8%), whose grandmother lived with them (75.5%) at home than those without grandmothers (65.5%) and these association was highly significant statistically with p-value <0.01. A similar significant association of dietary inadequacy was found with life satisfaction in the next four years.

The husband's education and being away from house for the last 6 months were also significantly associated with dietary inadequacy with a p-value <0.05. Dietary intake was most inadequate with no education (83.9%) and least inadequate with highest education (48.1%).

Significant association was observed between inadequate sanitation and inadequate dietary intake with p-value <0.001. Around 85% of women who were living without adequate sanitation facilities were taking inadequate diet, whereas dietary inadequacy in women who had adequate sanitary facilities was much less i.e. about 61%.

Table 56: Association of dietary inadequacy and family characteristics

Family factors		Dietary Intake				p-value
		Inadequate		Adequate		
		N	%	N	%	
Husbands employment	Manual Worker	144	73.5	52	26.5	0.004**
	Non Manual Worker	185	60.9	119	39.1	
Husband Education	Uneducated	26	83.9	5	16.1	0.032*
	Primary/middle	131	67.5	63	32.5	
	Sec/H.Sec	159	64.1	89	35.9	
	Bachelor and above	13	48.1	14	51.9	
Family Structure	Nuclear	71	64.0	40	36.0	0.205
	Joint	204	64.4	113	35.6	
	Multiple	54	75.0	18	25.0	
Husband away from hor	No	277	68.1	130	31.9	0.026*
Last 6 months	Yes	52	55.9	41	44.1	
Life Satisfaction at pres	Satisfied	167	57.8	122	42.2	0.001**
	Moderately Satisfied	96	70.6	40	29.4	
	Not satisfied	66	88.0	9	12.0	
Life Satisfaction in ne	Satisfied	197	57.9	143	42.1	0.001**
Years	Moderately Satisfied	88	78.6	24	21.4	
	Not satisfied	44	91.7	4	8.3	
Grandmother lives in ho	No	38	65.5	20	34.5	0.001**
	Yes	77	75.5	25	24.5	
Two or more unde	No	282	67.3	137	32.7	0.177
children in house	Yes	47	58.0	34	42.0	
Two or more girl child i	No	267	65.3	142	34.7	0.269
family	Yes	62	68.1	29	31.9	
HCI	Not Crowded	272	67.5	131	32.5	0.604
	Crowded	57	58.8	40	41.2	
Suitable Accommodatio	No	79	79.0	21	21.0	
	Yes	250	62.5	150	37.5	0.002**

11.8 Dietary Inadequacy and its association with socioeconomic characteristics

It was observed that income of both husband and wife, women empowerment status and family debt and money for food, all these factors had highly significant association with dietary inadequacy (p-value <0.01) as shown in Table 57 .

About 71% of women whose husband's income were less than Rs. 12,000 were taking inadequate diet. This proportion was reduced to 50% in women whose husband's

income were more than Rs. 30,000. Similarly, 78% of women were taking inadequate diet whose own income was less than Rs. 12,000.

Nearly three quarters of women (73.5%) were taking inadequate diet that had no financial empowerment whereas 60.9% of women who had financial empowerment were taking inadequate diet.

Table 57: Association of dietary inadequacy with socioeconomic characteristics

Socio- Economic factors		Dietary intake				p-value
		Inadequate		Adequate		
		N	%	N	%	
Wife Work Status	No	302	65.4	160	34.6	0.481
	Yes	27	71.1	11	28.9	
Husband Income	< 12,000	208	71.0	85	29.0	0.006**
	12,001-21,000	88	62.9	52	37.1	
	21,001 – 30,000	16	47.1	18	52.9	
	>30,001	17	51.5	16	48.5	
Total Income	< 12,000	209	64.5	115	35.5	0.352
	12,001-21,000	45	76.3	14	23.7	
	21,001 – 30,000	30	63.8	17	36.2	
	>30,001	45	64.3	25	35.7	
Wife financial Empowerment Status	No	144	73.5	52	26.5	0.004**
	Yes	185	60.9	119	39.1	
Wealth Index	Poorest	78	77.2	23	22.8	0.011*
	Poor	133	68.2	62	31.8	
	Average	55	55.0	45	45.0	
	Rich	52	61.9	32	38.1	
	Richest	11	55.0	9	45.0	
Asset Livestock	No	132	63.5	76	36.5	0.352
	Yes	197	67.5	95	32.5	
Asset Farming	No	132	62.0	81	38.0	0.121
	Yes	197	68.6	90	31.4	
Asset Crops	No	176	64.5	97	35.5	0.491
	Yes	153	67.4	74	32.6	
Assets Crops	for own consumpti	183	67.0	90	33.0	0.524
	Mostly for sale	146	64.3	81	35.7	
Have Money For E Needs	No	71	78.9	19	21.1	0.015*
	Yes	254	62.9	150	37.1	
	Don’t know	4	66.7	2	33.3	
Money For Food	No	75	82.4	16	17.6	0.001**
	Yes	240	61.4	151	38.6	
	Don’t know	14	77.8	4	22.2	
Family debt	No	133	57.6	98	42.4	0.001**
	Yes	175	74.2	61	25.8	
	Don’t know	21	63.6	12	36.4	
Wife Occupation	Manual Worker	21	80.8	5	19.2	0.052
	Non Manual Worke	6	50.0	6	50.0	
Wife Income	< 12,000	26	78.8	7	21.2	0.007**
	12,001-21,000	1	20.0	4	80.0	
	21,001 – 30,000	0	0.0	0	0.0	
	>30,001	0	0.0	0	0.0	

11.9 Dietary Inadequacy and its association with stressful life events

In the present research, we have asked the participants about ten stressful life events as listed in Table 58. It was observed that six out of ten stressful life events were significantly associated with dietary inadequacy, including financial problems, residential problems, problems in marital relation, and problems in relation with family and friends, quarrel among family members and worriedness about children.

Around 73% of women who had financial problems were taking inadequate diet while this is reduced to 58% in women without financial problems and this association was highly significant with $p<0.001$.

Women who had problems in residence, 87.7% had inadequate diet with $p<0.01$.

Inadequate dietary intake was also significantly associated ($P<0.01$) with problems in relationship with their spouse. Inadequacy was found in diet of 78% women who were facing this problem.

Proportion of women who were taking inadequate diet and were worried about their children was 80.7% and this relation was also statistically significant with $p<0.01$.

Table 58: Association of stressful life events with dietary inadequacy

Stressful Life Events		Dietary Intake				p-value
		Inadequate		Adequate		
		N	%	N	%	
"You yourself or a close relative of y had been ill or had an accident which led to hospitalizations"	No	177	64.1	99	35.9	0.382
	Yes	152	67.9	72	32.1	
"Any of your close relatives died or committed suicide or had gotten seriously ill"	No	153	69.9	66	30.1	0.091
	Yes	176	62.6	105	37.4	
"Has anyone in your family had prob of livelihood"	No	149	62.6	89	37.4	0.151
	Yes	180	68.7	82	31.3	
"You or someone in your family had financial problem"	No	136	57.9	99	42.1	<0.001***
	Yes	193	72.8	72	27.2	
"You or someone in your family has h a change in social status"	No	184	63.9	104	36.1	0.394
	Yes	145	68.4	67	31.6	
"You yourself have had any problem your residence"	No	236	59.9	158	40.1	0.001**
	Yes	93	87.7	13	12.3	
"Your relations with any of yours clo relatives or friends have been troubled"	No	234	62.9	138	37.1	0.020*
	Yes	95	74.2	33	25.8	
"Your marital relations with your spo have had problem"	No	226	61.4	142	38.6	0.001**
	Yes	103	78.0	29	22.0	
"You have been worried about your children's problems"	No	164	55.4	132	44.6	0.001**
	Yes	165	80.9	39	19.1	
"You or other family members have h rows/ quarrels amongst themselves"	No	235	62.5	141	37.5	0.007**
	Yes	94	75.8	30	24.2	

11.10 Dietary Inadequacy and its association with categorized stressful life events

Table 59 shows the stressful events categorized if the women had 1-2 events, 3-4 or more than 5 events in last year. It is seen from table below that around 70% of the respondents who had food inadequacy had 3-4 or 5+ events in last one year while 52% were taking inadequate diet that experienced 1-2 stressful life events. This association between dietary inadequacy and stressful life events was found highly significant statistically with $p<0.01$.

Table 59: Association of categorized stressful life events with dietary inadequacy

Frequency of Stressful Life Events (Categorized)	Dietary Intake				p-value
	Inadequate		Adequate		
	N	%	N	%	
1-2	52	52.0	48	48.0	0.005**
3-4	82	70.1	35	29.9	
5+	195	68.9	88	31.1	

11.11 Dietary Inadequacy and its association with MSPSS

Table 60 shows the scores of perceived social support on three subscales of family, friends and significant other. The categories were merged to agree, balance and disagree. As seen in table, mean score of those who had food inadequacy was lower on all the subscales and the difference was significant except on family subscale. The association was also significant with $p<0.001$ while we compared the overall MSPSS score with dietary inadequacy.

Table 60: Dietary Inadequacy and its association with MSPSS

	Dietary Intake					
	Inadequate		Adequate			
MSPSS	**Mea**	**Std. Deviat**	**Mea**	**Std. Deviat**	**Mean Differ**	**p-value**
"There is a special person who is around when I am in need"	3.66	1.88	4.25	1.55	0.59	<0.001***
"There is a special person with whom I can share my joys and sorrows"	3.86	1.79	4.27	1.53	0.42	0.010*
"I have a special person who is a real source of comfort to me"	3.97	1.70	4.30	1.49	0.33	0.035*
"There is a special person in my life who cares about my feelings"	3.81	1.78	4.14	1.64	0.32	0.051
Score on significant Others subscale	**15.31**	**6.32**	**16.96**	**5.37**	**1.65**	**0.004****
"My family really tries to help me"	3.80	1.76	4.09	1.57	0.29	0.076
"I get the emotional help and support I need from my family"	3.85	1.75	4.08	1.63	0.23	0.164
"I can talk about my problems with my family"	3.78	1.79	4.06	1.61	0.28	0.087
"My family is willing to help me make decisions"	3.81	1.79	4.06	1.63	0.26	0.119
Score on Family subscale	**15.25**	**6.52**	**16.29**	**5.66**	**1.05**	**0.076**
"My friends really try to help me"	2.47	1.88	2.94	1.95	0.48	0.008**
"I can count on my friend when things go wrong"	2.34	1.83	2.97	1.91	0.62	<0.001***
"I have friends with whom I can share my joys and sorrows"	2.51	1.89	3.28	1.94	0.77	<0.001***
"I can talk about my problems with my friends"	2.65	1.92	3.32	1.94	0.67	<0.001***
Score on Friends subscale	**9.97**	**6.90**	**12.50**	**7.01**	**2.53**	**<0.001*****
MSPSS Total	**40.52**	**15.50**	**45.75**	**14.17**	**5.23**	**<0.001*****

11.12 Dietary Inadequacy and its association with Maternal Social Support (MSS)

Table 61 shows the association of food inadequacy with multiple variables regarding maternal social support in terms of fixing meals, grocery shopping, cleaning of house etc. It was seen that dietary inadequacy was high among those women who fixed meals and did grocery shopping alone as compared to those who did these along with someone else but the difference was not significant ($p>0.05$). Though the women who had authority of telling their children about differences in right or wrong were mostly taking inadequate diet but their proportion of taking inadequate diet were less than those women who were the mothers of children to whom someone else told about right or wrong and this association was statistically significant ($p<0.05$).

Table 61: Dietary Inadequacy and its association with MSS

MSSI	Categories	Food Intake				
		Inadequate		Adequate		
		N	%	N	%	p-value
Who fixes meals? Do…	You Generally Do It	210	66.2	107	33.8	0.697
	Generally Someone Else Dc	33	70.2	14	29.8	
	You and Someone Else Do	85	63.0	50	37.0	
	No One	1	100.0	0	0.0	
Who does the grocery shopping? Do …	You Generally Do It	22	64.7	12	35.3	0.34
	Generally Someone Else Dc	295	66.4	149	33.6	
	You and Someone Else Do	10	50.0	10	50.0	
	No One	2	100.0	0	0.0	
Who lets your children know what is right or wrong? Do …	You Generally Do It	84	63.6	48	36.4	0.041*
	Generally Someone Else Dc	16	76.2	5	23.8	
	You and Someone Else Do	137	72.1	53	27.9	
	No One	92	58.6	65	41.4	
Who fixes things around the house or apartment?	You Generally Do It	70	76.9	21	23.1	0.072
	Generally Someone Else Dc	195	63.5	112	36.5	
	You and Someone Else Do	51	60.7	33	39.3	
	No One	13	72.2	5	27.8	
Who does the cleaning?	You Generally Do It	192	68.6	88	31.4	0.388
	Generally Someone Else Dc	28	65.1	15	34.9	
	You and Someone Else Do	108	61.4	68	38.6	
	No One	1	100.0	0	0.0	
Who pays the bills?	You Generally Do It	4	66.7	2	33.3	0.957
	Generally Someone Else Dc	307	65.7	160	34.3	
	You and Someone Else Do	10	62.5	6	37.5	
	No One	8	72.7	3	27.3	
Who takes your children to the doctor if he/she is sick?	You Generally Do It	37	63.8	21	36.2	0.071
	Generally Someone Else Dc	91	67.4	44	32.6	
	You and Someone Else Do	111	72.5	42	27.5	
	No One	90	58.4	64	41.6	
Who sees to it that children go to bed?	You Generally Do It	193	71.0	79	29.0	0.541
	Generally Someone Else Dc	11	55.0	9	45.0	
	You and Someone Else Do	30	63.8	17	36.2	
	No One	95	59.0	66	41.0	
In general, would you like to see your relatives…?	You Generally Do It	81	66.4	41	33.6	0.219
	Generally Someone Else Dc	63	67.0	31	33.0	
	You and Someone Else Do	170	63.7	97	36.3	
	No One	15	88.2	2	11.8	

11.12.1 Dietary Inadequacy and its association with Maternal Social Support Index (MSSI)

Table 62 shows the index of available social support to the mother in terms of household chores, looking after the children, grocery, health care visits etc. Scores were calculated and it was seen that those who had inadequate dietary intake had higher scores as compared to those with dietary adequacy, however this difference was not significant ($p>0.05$).

Table 62: Association of Dietary Inadequacy with MSSI

	Dietary Intake							
	Inadequate			Adequate				
	N	Mean	Std. Deviat	N	Mean	Std. Deviati	Mean Difference	p-value
MSSI Score	329	13.02	6.35	171	12.00	6.88	1.02	0.098

11.13 Dietary Inadequacy and its association with Autonomy

Autonomy of women was categorized into two sections initially as autonomy in spending their own and husband's earnings and the second section was participation of women in decision making about their own health and major household purchases. Overall autonomy is calculated as cumulative autonomy score. These are presented in subsequent sections.

11.13.1 Dietary Inadequacy and autonomy about own and husband's earning

Table 63 shows the autonomy of the respondents in spending their own and husband's income. Only 9% women were working in the sample and out of those 41 for money and 5 got compensation other than money for work. Those who were working most had inadequate diet intake and most received money for work, very few got compensation for work and they all had inadequate diet.

Most of the women who earned money, their husbands (75%) decided how the money should be used. Decision about husband's earnings was mostly done by other family members and husband himself.

Table 63: Association of food inadequacy with women autonomy on earning

Autonomy		Dietary Intake				p-value
		Inadequate		Adequate		
		N	%	N	%	
Have you done any work in the last 12 months?	No	298	65.6	156	34.4	0.811
	Yes	31	67.4	15	32.6	
Have you received any cash for the work that you have done?	No	301	65.6	158	34.4	0.725
	Yes	28	68.3	13	31.7	
Have you received any compensation other than money for the work that you have done?	No	324	65.5	171	34.5	0.105
	Yes	5	100.0	0	0.0	
Who decides how the money you earn or the goods that you receive will be spent or used?	You only	19	61.3	12	38.7	0.604
	Your husband only	3	75.0	1	25.0	
	Both	5	100.0	0	0.0	
	You & other family members	1	100.0	0	0.0	
	Other members	3	60.0	2	40.0	
	No earning	298	65.6	156	34.4	
Who decides how your husband's earnings will be spent?	You only	16	64.0	9	36.0	0.014*
	Your husband only	98	68.1	46	31.9	
	Both	51	60.7	33	39.3	
	You & other family members	8	40.0	12	60.0	
	Other members	115	64.6	63	35.4	
	Husband has no earnings	41	83.7	8	16.3	

11.13.2 Dietary Inadequacy and its association with decision making and autonomy

Most of the times decision about her own health was made by other family members like mother-in-law, sister-in-law followed by husband among those who had inadequate intake and the association was significant ($p<0.05$). Women who decided themselves about their health issues were mostly taking inadequate diet (73%) as compared to women who were making decision with husbands and other family members (55%). Decision about major household purchases was done by other family members and husband and a similar pattern was seen in decision about women's visit to her family

and their association with dietary intake was not significant statistically as shown in Table 64.

Cumulative score on autonomy was calculated and the lowest third scores were for those who had low autonomy, middle third for moderate and highest third for high as shown in Table 64. The proportion of women who had inadequate diet was high among all the three categories of autonomy and it was highest (75%) among those who scored high in autonomy but the difference was not significant statistically (p=0.697).

Table 64: Association of food inadequacy with women's decision making

Women's decision making factors		Dietary Intake				p-value
		Inadequate		Adequate		
		N	%	N	%	
Most of the time, who makes decisions about health care for you?	You only	54	73.0	20	27.0	0.035*
	Your husband only	87	67.4	42	32.6	
	Both	57	55.9	45	44.1	
	You & other family member	26	55.3	21	44.7	
	Other members	105	70.9	43	29.1	
Most of the time, who makes decisions about making major household purchases (e.g. fan, TV, bicycle, water pump, etc.)?	You only	8	50.0	8	50.0	0.373
	Your husband only	107	68.2	50	31.8	
	Both	44	62.9	26	37.1	
	You & other family member	24	57.1	18	42.9	
	Other members	146	67.9	69	32.1	
Most of the time, who makes decisions about making purchases for daily household needs? (grocery items such as eggs, bread, washing powder, soap)?	You only	29	74.4	10	25.6	0.068
	Your husband only	99	73.3	36	26.7	
	Both	31	56.4	24	43.6	
	You & other family member	33	57.9	24	42.1	
	Other members	137	64.0	77	36.0	
Most of the time, who makes decisions about visits to your family and relatives (e.g. parents, brothers, sisters, Chacha-chachi, mama-mami, etc.)?	You only	27	62.8	16	37.2	0.187
	Your husband only	109	70.8	45	29.2	
	Both	53	56.4	41	43.6	
	You & other family member	23	62.2	14	37.8	
	Other members	117	68.0	55	32.0	
Do you have time to do things for yourself?	No	79	69.3	35	30.7	0.154
	Yes	189	62.6	113	37.4	
	Some times	61	72.6	23	27.4	
Cumulative Autonomy Score	Low	130	66.3	66	33.7	0.697
	Moderate	187	64.9	101	35.1	
	High	12	75.0	4	25.0	

11.14 Dietary Inadequacy and its association with IPV

IPV was categorized into psychological, physical and sexual. Each of these categories were assessed by using multiple variables, all of these individual variables were analyzed to see their association with dietary inadequacy as shown in subsequent sections.

11.14.1 Dietary Inadequacy and its association with psychological IPV

Table 65 shows the difference in the frequency of variables related to psychological IPV among those who had food inadequacy and those who did not in last one year. Dietary inadequacy was more in women (79.4%) who were insulted by their partners and this association was highly significant ($p<0.001$).

Most of the women (78.7%) who experienced a scaring or a ‘smashing things’ by their husbands were taking inadequate diet than those who did not (62.3%) and this association was significant ($p<0.01$). Dietary inadequacy was higher among those who experienced any type of psychological violence (74.7%) than others (60.3%) and the difference was statistically significant ($p<0.01$).

Table 65: Dietary Inadequacy and its association with psychological IPV

Psychological IPV	Categories	Dietary Intake				p-value
		Inadequate		Adequate		
		N	%	N	%	
"Has your husband ever Insulted you or made you feel bad about yourself?"	No	200	60.2	132	39.8	<0.001***
	Yes	112	79.4	29	20.6	
	No Response	17	63.0	10	37.0	
"Has this happened in the past 12 Months?"	No	13	72.2	5	27.8	<0.001***
	Yes	98	80.3	24	19.7	
	No Response	218	60.6	142	39.4	
"Has this happened one or two times, three to five times or more than 5 times?"	1-2 times	21	65.6	11	34.4	<0.001***
	3-5 times	19	76.0	6	24.0	
	6+ times	58	89.2	7	10.8	
	No Response	231	61.1	147	38.9	
"Did things that scared or intimidated you on purpose, e.g. by the way he looked at you, or by yelling or smashing things?"	No	228	62.3	138	37.7	0.006**
	Yes	85	78.7	23	21.3	
	No Response	16	61.5	10	38.5	
"Has this happened in the past 12 Months?"	No	6	66.7	3	33.3	0.004**
	Yes	79	79.8	20	20.2	
	No Response	244	62.2	148	37.8	
"Has this happened one or two times, three to five times or more than 5 times?"	1-2 times	21	67.7	10	32.3	0.002**
	3-5 times	20	76.9	6	23.1	
	6+ times	38	90.5	4	9.5	
	No Response	250	62.3	151	37.7	
"Threatened to hurt you or someone you care about?"	No	287	64.9	155	35.1	0.194
	Yes	25	80.6	6	19.4	
	No Response	17	63.0	10	37.0	
"Has this happened in the past 12 Months?"	No	8	80.0	2	20.0	0.198
	Yes	17	81.0	4	19.0	
	No Response	304	64.8	165	35.2	
"Has this happened one or two times, three to five times or more than 5 times?"	1-2 times	4	66.7	2	33.3	0.391
	3-5 times	6	85.7	1	14.3	
	6+ times	7	87.5	1	12.5	
	No Response	312	65.1	167	34.9	
Cumulative psychological IPV (If yes to any of the psychological violence)	**No**	**187**	**60.3**	**123**	**39.7**	**0.001****
	Yes	**142**	**74.7**	**48**	**25.3**	

11.14.2 Dietary Inadequacy and its association with physical IPV

As shown in Table 66, dietary inadequacy was more in women (83.3%) who had experienced physical violence of their partners in form of a slap or push or pulling of hairs and this association was highly significant ($p<0.001$).

Dietary inadequacy was higher among those women who had experienced any type of physical violence by their partner than those who did not but this difference was not significant statistically in any types of the physical violence (all $p>0.05$). While comparing the cumulative score of physical violence with dietary inadequacy it was observed that women who said "yes" to any of the physical violence were mostly (79.2%) taking inadequate diet than the others (61.1%) and this difference was also significant ($p<0.001$).

Table 66: Dietary Inadequacy and its association with physical IPV

Physical IPV	Categories	Dietary Intake				p-value
		Inadequate		Adequate		
		N	%	N	%	
"Slapped you or thrown something at you that could hurt you? Pushed you or shoved you or pulled your hair?"	No	227	61.2	144	38.8	<0.001***
	Yes	85	83.3	17	16.7	
	No Response	17	63.0	10	37.0	
"Has this happened in the past 12 Months?"	No	7	58.3	5	41.7	<0.001***
	Yes	78	86.7	12	13.3	
	No Response	244	61.3	154	38.7	
"Has happened one or two times, three to five times, or more than 5 times"	1-2 times	36	78.3	10	21.7	<0.001***
	3-5 times	22	100.0	0	0.0	
	6+ times	20	90.9	2	9.1	
	No Response	251	61.2	159	38.8	
"Choked or burnt you on purpose?"	No	300	65.4	159	34.6	0.207
	Yes	13	86.7	2	13.3	
	No Response	16	61.5	10	38.5	
"Has this happened in the past 12 Months?"	No	3	100.0	0	0.0	0.193
	Yes	10	83.3	2	16.7	
	No Response	316	65.2	169	34.8	
"Has happened one or two times, three to five times, or more than 5 times"	1-2 times	2	66.7	1	33.3	0.425
	3-5 times	3	75.0	1	25.0	
	6+ times	5	100.0	0	0.0	
	No Response	319	65.4	169	34.6	
"Threatened to use a gun, knife or other Weapon against you?"	No	298	65.1	160	34.9	0.053
	Yes	15	93.8	1	6.3	
	No Response	16	61.5	10	38.5	
"Has this happened in the past 12 Months?"	No	3	100.0	0	0.0	0.055
	Yes	12	92.3	1	7.7	
	No Response	314	64.9	170	35.1	
"Has happened one or two times, three to five times, or more than 5 times"	1-2 times	3	75.0	1	25.0	0.176
	3-5 times	4	100.0	0	0.0	
	6+ times	5	100.0	0	0.0	
	No Response	317	65.1	170	34.9	
"Actually used a gun, knife or other weapon against you?"	No	311	65.9	161	34.1	0.535
	Yes	2	100.0	0	0.0	
	No Response	16	61.5	10	38.5	
"Has this happened in the past 12 Months?"	No	1	100.0	0	0.0	0.593
	Yes	1	100.0	0	0.0	
	No Response	327	65.7	171	34.3	
"Has happened one or two times, three to five times, or more than 5 times"	1-2 times	1	100.0	0	0.0	0.471
	3-5 times	0	0.0	0	0.0	
	6+ times	0	0.0	0	0.0	
	No Response	328	65.7	171	34.3	
Cumulative physical IPV (If yes to any of the physical violence)	**No**	**226**	**61.1**	**144**	**38.9**	**<0.001**
	Yes	**103**	**79.2**	**27**	**20.8**	

11.14.3 Dietary Inadequacy and its association with sexual IPV

The present study also assessed the association of sexual IPV and dietary inadequacy as shown in Table 67. Dietary inadequacy was higher in women whose partners forced them to do sexual intercourse against their will (72.5%) and who did sexual intercourse due to fear of their partners (74.3%) than their counterparts but the association was not significant ($p>0.05$). The only variable related to sexual IPV that found significant association ($p<0.01$) with dietary inadequacy was degrading or humiliating sexual activities done by women due to their husband's pressure. The percentage of women who were doing humiliating sexual activities due to their husband's pressure and were taking inadequate diet was 93.5% while those who did not experience such IPV was 63.8%. The percentage of women who said "yes" to any of the sexual violence and were taking inadequate diet was higher (70.2%) than those who did not (63.1%) but the association was not significant ($p>0.05$).

Table 67: Dietary Inadequacy and its association with Sexual IPV

		Dietary Intake				
		Inadequate		Adequate		
Sexual IPV	Categories	N	%	N	%	p-value
"Did your husband ever physically	No	224	63.8	127	36.2	0.262
force you to have sexual intercourse	Yes	74	72.5	28	27.5	
when you did not want to?"	No Response	31	66.0	16	34.0	
"Has this happened in the past 12	No	3	50.0	3	50.0	0.227
Months?"	Yes	70	73.7	25	26.3	
	No Response	255	64.1	143	35.9	
	9	1	100.0	0	0.0	
"Has happened one or two times,	1-2 times	14	60.9	9	39.1	0.182
three to five times or more than 5	3-5 times	21	72.4	8	27.6	
times"	6+ times	34	81.0	8	19.0	
	No Response	259	64.0	146	36.0	
	9	1	100.0	0	0.0	
"Had sexual intercourse when you did	No	223	63.4	129	36.6	0.197
not want to because you were afraid	Yes	75	74.3	26	25.7	
of what your husband might do?"	No Response	30	65.2	16	34.8	
	9	1	100.0	0	0.0	
"Has this happened in the past 12	No	6	75.0	2	25.0	0.134
Months?"	Yes	69	74.2	24	25.8	
	No Response	254	63.7	145	36.3	
"Has happened one or two times,	1-2 times	13	65.0	7	35.0	0.65
three to five times or more than 5	3-5 times	19	65.5	10	34.5	
times?"	6+ times	37	84.1	7	15.9	
	No Response	260	63.9	147	36.1	
"Your husband ever forced you	No	270	63.8	153	36.2	0.003**
to do something sexual that you	Yes	29	93.5	2	6.5	
found degrading or humiliating?"	No Response	30	65.2	16	34.8	
"Has this happened in the	No	3	75.0	1	25.0	0.002**
past 12 Months?"	Yes	26	96.3	1	3.7	
	No Response	300	64.0	169	36.0	
"Has this happened one or two times,	1-2 times	9	90.0	1	10.0	0.007**
three to five times or more than	3-5 times	5	100.0	0	0.0	
5 times?"	6+ times	12	100.0	0	0.0	
	No Response	303	64.1	170	35.9	
Cumulative sexual IPV	**No**	**197**	**63.1**	**115**	**36.9**	**0.106**
If yes to any of the sexual violence	**Yes**	**132**	**70.2**	**56**	**29.8**	
How often were you afraid that	Always	7	77.8	2	22.2	0.003**
your husband might do some of	Often	11	100.0	0	0.0	
these things we've talked about, like	Sometime	20	87.0	3	13.0	
hurting you physically or forcing you	Rarely	15	88.2	2	11.8	
sexually?	Never	43	57.3	32	42.7	
	No Response	233	63.8	132	36.2	

11.15 Generalized Linear Model (GLM)

Table 68 shows the logistic regression model for food inadequacy. The model shows that one of the factors which predict the inadequacy of dietary intake among pregnant women was depression. Depressed women were 1.7 times more likely to have inadequate diet intake (OR 1.7, CI 1.03-2.66, P<0.05) as compared to non-depressed.

Second predictor variable was women's education, those who had a bachelor's degree or above were less likely to have dietary inadequacy (OR 0.2 CI 0.09-0.55, P<0.05). Women whose husbands were away from home for the last 6 months were 40% less likely to have inadequate diet than those whose husbands were not away from home (OR 0.6, CI 0.33-0.95, p<0.05).

Similarly, women who were living with adequate sanitation facilities had 50% less chances of taking inadequate diet as compared to those who did not had adequate sanitary facilities at their home (OR 0.5, CI 0.24-0.94, p<0.05).

Odds of taking inadequate diet was 4.7 times higher in women who perceived that they would not be satisfied in the next four years of life than those who were satisfied (OR 4.7, CI 1.35-16.16, p<0.05).

Though odds of inadequate dietary intake were 1.6 and 2 times higher among those women who had experienced 5+ and 3-4 stressful life events respectively, the association was not significant in case of 5+ life events. While the association of dietary inadequacy and had 3 - 4 stressful life events was statistically significant even on regression analysis (OR 2.0, CI 1.05-3.81, p<0.05).

Moreover, odds of taking inadequate diet were almost double (OR 1.9, CI 1.03-3.53, p<0.05) in women who were exposed to physical violence by their intimate partners than those who were not.

Women who had social support from friends were 10% less likely to have inadequate diet than those who did not (OR 0.9, CI 0.93-0.99, p<0.05)

Factors like age of women, husband's education, women work, and money for food, health expenditure in last month did not show any significant association with dietary intake on regression analysis.

Table 68: Generalized Linear Model of Food Inadequacy

Variable Factors	Categories	Odds Ratio	95% C.I.		p- value
			Lower	Upper	
Depression	Yes	1.7	1.03	2.66	<0.039*
Age of women	15-22 (Ref)				0.172
	23-30	1.7	0.95	2.97	0.077
	31 +	1.3	0.61	2.64	0.518
Wife education	Uneducated (Ref)				0.000
	Primary /middle	1.2	0.61	2.29	0.630
	Sec/higher sec	0.9	0.42	1.74	0.676
	Bachelor and above	0.2	0.09	0.55	0.001**
Husband education	Uneducated (Ref)				0.058
	Primary /Middle	0.4	0.15	1.35	0.153
	Sec/High sec	0.9	0.28	2.65	0.792
	Bachelor and above	0.9	0.22	3.91	0.918
Husband away from home last 6 months	Yes	0.6	0.33	0.95	0.033*
Life satisfaction in 4years	Satisfied				0.038
	Moderately satisfied	1.5	0.82	2.69	0.198
	Not satisfied	4.7	1.35	16.16	0.015*
Wife works		1.9	0.76	4.75	0.171
Adequate Sanitation	Yes	0.5	0.24	0.94	0.031*
Money for Food	No (Ref)				0.223
	Yes	0.6	0.27	1.50	0.302
	Don't know	2.1	0.34	12.96	0.432
Health expenditure in last month		3.2	0.89	11.68	0.076
LEC Score	1-2 events				0.092
	3-4 events	2.0	1.05	3.81	0.036*
	5+ events	1.6	0.93	2.82	0.087
MSPSS Friends subscale	Yes	0.9	0.93	0.99	0.012*
IPV Physical	Yes	1.9	1.03	3.53	0.040*

11.16 Summary

Chapatti/ paratha made from wheat is the staple food in the study area and all the participant eat them daily. More than 70% of participants used pulses and rice weekly. More than half of the respondents 261(52.2%) ate fruits daily. Meat was taken by 26% on weekly basis while only 18.6% of women were taking egg daily. Milk was taking by 43.6% of women daily but the consumption of oil/ghee was very high that is almost all (97.4%) women were using in daily cooking.

More than 90% of women were taking less than the recommended amount of grains and vegetables, while the women who were taking less than recommended servings of dairy and fruits were also very high i.e. 83.8% & 78% respectively.

Depression was significantly associated with inadequate intake of meat, grains (both p-value <0.01), fruits and milk (both p-value <0.001).

Frequency of meals also had significant association with depression ($p<0.001$), women who were taking ≤ 3 meals a day were more depressed (68.4%) than non-depressed (31.6%). There were more depressed women compared to non-depressed who did not take lunch ($p<0.00$) and dinner ($p<0.01$).

Mean intake of all the macronutrients was less among depressed as compared to non-depressed women and the difference was statistically significant with a p-value of <0.001. In micronutrients, mean intake of vitamin in depressed women was less as compared to non-depressed. The association was significant between depression and mean intake of minerals, Vitamin E and folic acid (all $p<0.01$). Daily intakes of all macronutrients were lower in depressed as compared to non-depressed and the difference was statistically significant in case of energy, proteins and carbohydrates.

Maternal characteristics like depression, education, health status in last 30 days, number of pregnancies and living children were significantly associated with an inadequate dietary intake.

Husband's employment, education, being away from home in the last 6 months, life satisfaction in one year and next four years were the family factors which showed significant relationship with inadequate diet.

Socio-economic factors which showed significant association with inadequate diet include husband and women income, women financial empowerment status, wealth index, family debt, money for basic need and food.

The association between dietary inadequacy and stressful life events was found highly significant statistically with $p<0.01$, it was observed that women who had 3-4 LEC were mostly taking inadequate diet than those had 1-2 LEC.

It was observed that the mean score of those who had food inadequacy was lower on all the subscales of MSPSS and the difference was significant except on the family subscale.

Regarding MSSI, those who had inadequate dietary intake had higher scores as compared to those with dietary adequacy, however this difference was not significant ($p>0.05$).

Working women mostly had inadequate dietary intake. Decision about women's own health was mostly made by other family members among those who had inadequate intake and this association was significant ($p<0.05$).

In IPV, cumulative psychological and physical IPV showed significant association with dietary inadequacy. Moreover, although the dietary inadequacy was more prevalent in those women who were exposed to any type of sexual violence also but the association was not significant statistically.

Finally, factors that showed significant association with dietary inadequacy even in generalized linear model were depression, husband not away from home in last 6 months, women who perceived that they would not be satisfied with their life in next 4 years, living without adequate sanitation facilities, Physical IPV and 3-4 LEC.

CHAPTER 12

DISCUSSION

12.1 Introduction

Pakistan is currently the sixth and will be the fourth most populous nation by 2050 (Demographic, 2015). Over the past two decades there has been hardly any difference in the malnutrition situation in spite of more food availability and an overall increase in caloric intake per capita. The purchasing power of people is decreasing day by day. Due to the large family sizes 46 % of the family income is spent on food whereas this amount is 35% in India and only 7% in the US (Bhutta et al., 2011). In pregnancy, the nutritional requirements are increased to meet the maternal and fetal needs. Adequate intake of calories and nutrients is essential for healthy mother and baby. Depressive symptoms in prenatal period are related to inadequate nutrition (Black et al., 2008)

In order to understand the reasons for the problem of prenatal depression and under nutrition and to plan and implement appropriate interventions and programs, the usual situations and the context in which it has arisen needs to be considered.

In the present study, an endeavor was made to explore the effects of diet on health of a pregnant woman as many previous studies had their emphasis on finding an association between poor maternal nutrition and its adverse effects on the fetus (Prado and Dewey, 2014, Edwards et al., 2001, Aizer and Currie, 2014, Hoet and Hanson, 1999, Langley-Evans, 2015, Osrin and Anthony, 2000, Wu et al., 2004, King, 2003, Tarry-Adkins et al., 2013, Brenseke et al., 2013, Imdad and Bhutta, 2012a). In order to achieve this, we explored the relationship of dietary inadequacy with socio-economic and demographic variables as well as stressful life events, perceived and available social support, decision-making and IPV. Finally we used a generalized linear model to show the association of food inadequacy with prenatal depression and its risk factors.

12.2 Summary of the Findings

Very few women during pregnancy had adequate diet in a day as measured through 24-hour recall and the food frequency questionnaire. Depressed women in pregnancy had fewer intakes of milk, fruit, vegetables and meat groups on a daily basis but the intake of grains and oils was consumed daily by more than 80% of the women.

Overall the mean intake of all the macro- and micronutrients, vitamins and minerals was low in depressed as compared to the non-depressed, with the exception of Vitamin A and C. Food variety scores were negatively associated with depression.

Maternal characteristics like prenatal depression, education, health status in last 30 days, number of pregnancies and living children were significantly associated with inadequate dietary intake. Husband's employment, education, being away from house in the last 6 months, life satisfaction in the last one year and perceived satisfaction in the next four years were the family factors which showed significant relationship with inadequate diet. Economic factors which showed significant association on univariate analysis with inadequate diet include husband and women income, women financial empowerment status, wealth index, family debt, money for basic need and food.

The association between dietary inadequacy and stressful life events, all the three subscales of MSPSS, MSSI, and IPV physical and psychological was also significant on univariate analysis.

Finally, factors that showed independent association with dietary inadequacy in generalized linear model were prenatal depression, husband not away from home in the last 6 months, life satisfaction in the next 4 years, adequate sanitation facilities, Physical IPV and 3-4 stressful life events.

12.3 Strengths and Limitations

This is one of the first population-based studies to explore the relationship of prenatal depression and dietary intake of women in the rural setting of Pakistan. The data collection team along with the student researcher carefully collected data by interviews. Dietary data was collected using well designed FFQ and 24-hour recall. The food list was thoroughly prepared in consultation with relevant nutrient analysis tables and exploring

the commonly consumed food items in the study area. The section below will present the strengths and weaknesses of the various components of the study.

12.3.1 Study Population

In developing countries more than 60% of the population lives in rural areas but their dietary intake and deficiencies and its relationship with prenatal depression remains unknown. The sample for such a study needs to be community based as according to PDHS 2012-13 only 67% of rural women receive antenatal care from the health facilities. If the sample is taken from health facilities, some of these women might be missed. The strength of this study is that the sample of pregnant women in second and third trimester of pregnancy was selected from the registers of LHW and was representative of the rural community. As more than 85% of the rural communities are covered by LHWs, so those pregnant women who live in areas not covered by LHWs might have been missed from the study. This study cannot be generalized the entire pregnant women of Pakistan as it represents low income rural women registered with LHWs.

12.3.2 Study Design

Some of the strengths and weaknesses of cross-sectional study design related to prevalence and risk factors of prenatal depression have been discussed in Chapter 6 of the study.

Cross-sectional is one of the most common types of population-level study designs in which a set of measurements of a population at a particular point in time is captured (Yu and Tse, 2012). As the objective of the current study is to explore the association of prenatal depression with dietary intake of a population of pregnant women, a phenomenon which is less researched (Mann, 2003), the cross-sectional method is a suitable design for this study . There is a growing interest among researchers to study association between dietary intake and other health related factors (Der Marderosian, 1993). As my study also explores the relationship of dietary intake of pregnant women with prenatal depression, it is a suitable design to generate hypothesis which can be tested using cohort or longitudinal designs.

The limitation of the current study is its cross-sectional design which prevents conclusive inferences about the direction of the relationship between diet and prenatal

depression. The study was cross-sectional and thus the data collected does not show variation in dietary practices by seasons of the year.

12.4 Dietary Assessment Measures

12.4.1 24-hour Dietary Recall

Description of the various dietary assessment measures was given in Chapter 9.

For the current study we selected the food frequency questionnaire and 24-hour recall methods. When selecting a nutritional assessment method an important consideration is the context in which the data will be used (Beaton et al., 1979). As the objective of our study was to collect the mean diet intake of the population of pregnant women and compare between the groups of depressed and non-depressed, so the 24-hour recall was best suited because of its open ended nature and low burden and cost. Another advantage of 24-hour recall is that it is well suited for less educated populations, as in my study, for whom keeping food records is not possible. In addition as the recalls are interviewer administered, data could be collected consistently as all interviewers in my study were well trained and educated. A major disadvantage of dietary recall is that it is based on the respondent's memory and ability to estimate portion sizes which may introduce recall bias and social desirability which influences self-reports (Beaton et al., 1979). There is a possibility of under reporting in 24-hour recall.

12.4.2 Food Frequency Questionnaire

The second method for dietary assessment used in my study was food frequency questionnaire. We selected the "Food Frequency Questionnaire" which has been validated for use by pregnant women and was taken from National Nutrition Survey, Pakistan, 2011 (Bhutta et al., 2011). It has been modified and adapted for this study. Many studies have validated use of FFQs among pregnant women (Greeley et al., 1992, Suitor et al., 1989, De Vriese et al., 2001, Erkkola et al., 2001, Brown et al., 1996b, Li et al., 2014, Vioque et al., 2013), however, studies from Pakistan (Iqbal et al., 2009, Safdar et al., 2013), validated FFQs only in the general adult population.

FFQ is frequently used in epidemiological studies to capture data on a usual long-term diet. In this study, the frequency of consumption of items from food groups as per

the food guide pyramid was recorded for the previous one month. The advantage is that it is close-ended less of a burden on the respondent as the food list is available. But the disadvantage is that participants have to recall the frequency of intake for the last one month e.g in my study I asked if they consumed various items from food groups and its frequency from monthly, weekly and daily basis and recall bias is possible.

Another limitation of the study was lack of information on women's physical activity as physical exercise may affect or improve on mental health (Mandelli et al., 2006).

12.5 Discussion of Significant Dietary Factors

12.5.1 Frequency of the Items Which Constitute Various Food Groups

In the present study, food groups were based on USDA food guide pyramid. We had the grains group (roti, nan, paratha, rusk, bread, pulses, and rice) vegetable, fruit, meat (mutton, beef, chicken, organ meat, fish, egg) milk and milk products (milk, yoghurt, cheese) and ghee/oil group**.** Based on the FFQ, it was observed that wheat, which is the staple food in Pakistan, in the form of roti/nan/chapatti, was used daily by the participants. The same was true regarding oil/ghee and milk. Meat, chicken, egg and vegetables were consumed on a weekly basis. Consumption of fish was on a monthly basis. Another study in Peshawar (Din et al., 2014), Pakistan, found similar results with respect to frequency of wheat, fat/oil, milk, fruits and meat consumption. Wheat is staple food, oil or ghee is used for cooking so it was used on a daily basis. Milk, fruit and meat are preferred by pregnant women to be healthy in pregnancy and were used with varying frequency weekly. In an Indian study (Lukose et al., 2014), in the biomarkers of nutritional status, only anemia was linked to antenatal depression, with depressive symptoms being less common among anemic women compared to non-anemic subjects. Serum Vitamin B12 and red cell folate levels were not associated with the presence of antenatal depression. This study used biochemical analysis and was focused on nutrients specific for anemia, not on the nutrients overall.

An American study observed that depressed pregnant women have increased intake of sugar and oils (Hurley et al., 2005)

12.5.2 Association of Macronutrient Intake with Prenatal Depression

In the study population, daily dietary consumption of almost all food groups was found to be deficient according to the RDA (1791 vs 2500kcal). Our findings are consistent with those of NNS, Pakistan, carried out in 2011, where it was found that women in their fertile years generally consume less energy than recommended (1864 vs 2100kcal) (Bhutta et al., 2011). It is expected that for pregnant women it would be much lower. The findings of a study carried out by Ahmad et al, are congruent with our findings, showing that 51% of the population in Pakistan was food insecure and consumed less than 2100kcal per day, the numbers being double in rural areas as compared to urban areas (Ahmad, 2009). In the present study, depressed women, on an average, consumed 240kcal less as compared to non-depressed women. These findings were supported by a few other studies as well where it was observed that energy intake by depressed mothers is less as compared to those who are not depressed (Hyun, 1997, Bae et al., 2010). A study cohort study in Pakistan reported 151kcal lower consumption of energy by depressed pregnant women at the start which was further reduced to 316kcal less than in non-depressed women at the end of the cohort (Saeed et al., 2016a). However, a study carried out in Peshawar, found that depressed women consumed more energy as compared to non-depressed (1991 vs 1869kcal) but the difference was not significant (Din et al., 2014).

As far as other macronutrients are concerned in our study mean intake of proteins, carbohydrates and fats was low according to the respective RDAs. As compared to the non-depressed the depressed pregnant women had much lower mean intake of all macro-nutrients and the difference is significant (<0.001). In NNS 2011 non pregnant women were taking low protein and fat but higher mean intake of carbohydrates as compared to RDA. The Peshawar study was similar to my study. The overall intake of macronutrients was lower than RDA and the mean intake of for the depressed was lower than the non-depressed, but unlike my study, this association was not significant. The difference may be due to different settings and instruments.

A study carried out in Baltimore, USA, came to the conclusion that depressed women tend to consume more macronutrients (Hurley et al., 2005). These differences in results can be attributed to the fact that firstly, this study is community-based; secondly,

simple food frequency questionnaire was used with no portion sizes. Portion sizes were quantified by using 24-hour recall method, whereas, the study carried out by Din et al was hospital-based and they used semi-quantitative food frequency questionnaire, where food portions are already quantified, with 91 food items. Inclusion of less food items in the present study is done keeping in mind the findings of a study carried out by Suitor et al where it was observed that fewer food items were also good enough to determine dietary intake quite accurately. (Suitor et al., 1989) The food list in this study is based on the Pakistani food basket and local foods items used in the study area. In a cohort study by Saeed et al, 24-hour dietary recall was used in a hospital based sample (Saeed et al., 2016a).

12.5.3 Association of Micronutrients and Minerals Intake with Prenatal Depression

Micronutrients intake was also below RDA in current study except PUFA and Vitamin A. Overall in the study intake of all the micronutrients was lower in depressed as compared to the non-depressed and this difference was statistically significant for PUFA, Vitamin E, folic acid, iron, zinc and calcium and not for Vitamin C and A. In the Peshawar study, consistent with my findings, the intake of calcium, iron and zinc, Vitamin A, and C was below the RDA and also lower in depressed as compared to non-depressed but the difference was significant for calcium and iron only. In NNS 2011 intake of iron and zinc was higher than RDA and calcium was slightly lower. The difference in the findings of NNS 2011 is due to their sample from both rural and urban areas and use of biochemical analysis as well, whereas our estimates are based on diet intake only.

In National Nutrition Survey, Pakistan, the overall consumption of folic acid among pregnant women was found to be 25.7% (Bhutta et al., 2011). We observed that there is less mean intake of folic acid among depressed pregnant women ($P<0.01$) in our study in comparison to those who are not depressed, indicating that deficiency of folic acid may have an association with depression (Reynolds, 2002).

Iron deficiency is quite prevalent among pregnant women not only in Pakistan (Anjum et al., 2015, Hussain et al.) but also in the United States (Wu et al., 2004). Despite the prevalence of anemia among pregnant women, it was observed that only 26.7% of them were taking Iron supplementation (Bhutta et al., 2011). In my study also, the mean

intake of iron was below RDA and depressed women were consuming significantly less iron, zinc and calcium as shown in previous studies which have associated zinc deficiency with maternal depression (Karimi et al., 2012).

12.5.4 Adequacy of Diet and Nutritional Status

For the purpose of analysis, the "Food Variety Score" (FVS) was created, and the score was calculated and dichotomized at median to give two categories of "adequate" and "inadequate" dietary intake. In the current study the mean FVS was higher for non-depressed (24.1+3.6) as compared to depressed (20.2+4.0) showing that the depressed women have less variety or diversity in their diet and this difference is statistically significant ($p<0.001$), which may be attributed to depressive symptoms. These findings are similar to the study conducted in Peshawar (Din et al., 2014). They calculated FVS from eight groups and found statistically significant differences in the mean scores of depressed and non-depressed hospital-based sample of pregnant women.

Women in developing countries face many nutrition related problems which have an adverse effect on the mother's health (Müller and Krawinkel, 2005). The most common problem related to women's nutrition in developing countries is malnutrition, specifically under nutrition, which increases maternal and child mortality along with an increase in overall disease burden (Lukose et al., 2014). Statistics show that approximately 40% of the women in the South East Asia region have a low Body Mass Index and the situation can be considered critical in India and Bangladesh. (Black et al., 2008, Walton and Allen, 2011, Merchant, 2014)

According to the National Nutrition Survey of Pakistan, 2011, 13% of non-pregnant and 16% of pregnant women were undernourished (Di Cesare et al., 2015, Bhutta et al., 2011) which is less as compared to the South Asian estimate.

In the present study, most of the women could not provide self-reported pre-pregnancy weight so we estimated the pre-pregnancy weight from their weight at enrolment in the study according to IOM recommendations (Council, 2009)(detail is provided in chapter 5). Based on BMI calculated from estimated pre-pregnancy weight more than half (51.2%) women were in normal category, 23.6% were underweight, 20% overweight and only 5.2 % were obese in the current study. But the difference in BMI

between women with adequate and inadequate diet intake was not found statistically significant.

Another cohort study from Pakistan (Saeed et al., 2016a) showed that in their sample none of the participants was in the underweight category and they did not find any association of BMI with healthy eating index. This cohort consisted of women attending ANC clinic in a city hospital and predominantly belonged to the middle socioeconomic class.

BMI categories of my study are similar to a study in pregnant Arab women in which half of the women were in normal BMI category. The overweight and obesity proportion in the Arab women, however, was greater as compared to my study. In this Arab study also, the pre-pregnancy weight was calculated (Abu-Saad et al., 2012). A limitation of calculating pre-pregnancy weight is underestimation of overweight and obesity as we calculate the pregnancy weight gain using the recommended weight gain weekly for normal weight women (Abu-Saad et al., 2012). However this method provides us a clue of the distribution of BMI in the absence of actual data of pre-pregnancy weight.

12.6 Discussion of Significant Demographic and Psychosocial Factors

12.6.1 Prenatal Depression

Mental health of women adversely affects her nutritional status especially during pregnancy (Won, 2011, Saeed et al., 2016a). Adequate intake of calories and nutrients is essential for healthy pregnancy and foetus (Hurley et al., 2005). The objective of the current study was to explore the association of prenatal depression with dietary intake of women living in a rural setting. Results showed that prenatal depression is a risk factor for dietary inadequacy OR 1.7(CI 1.03, 2.66) $P<0.05$. Similar results were seen in a study in Korea where diet of the women was inadequate based on RNI except Phosphorus (Won, 2011). Another Korean study showed that intake of energy and protein are higher in less stressed pregnant women (Bae et al., 2010). Previous studies have shown that food consumption and depression are inversely correlated with each other (Halbreich and Karkun, 2006) and that depression is usually amalgamated with decreased appetite, nonetheless, it can cause an increase in appetite as well (Association, 2013).

A Pakistani study conducted in Peshawar (Din et al., 2014) found that dietary fibre, iron, calcium and Vitamin B3 were associated with antenatal depression. This study was similar to my study as the mean FVS score in depressed women was lower as compared to non-depressed; thereby it is possible to link depression with food variety.

12.6.2 Women's Level of Education

Apart from the fact that education levels affect the socio-economic status of a person it directly influence food choices and level of knowledge of the mother (Murakami et al., 2009). The findings of the current study demonstrates that education level is a protective factor for dietary inadequacy OR 0.2 (CI 0.09, 0.55) P<0.001, as also shown in a study by Murakami in Japan where education was positively associated with healthy dietary intake pattern in a group of Japanese pregnant women. Results of another study conducted among white, well-educated pregnant women found unhealthy pattern of diet intake with increased consumption of macronutrients and low intake of micronutrients. A study in Africa found the education level of head of the household to be related to High FVS scores of women rather than her own education as the decision about the food choice was with him (Savy et al., 2005). Another study carried out in Texas, also observed that level of education can predict folic acid supplementation (Canfield et al., 2006). These differences may be due to different cultures.

12.6.3 Adequate Sanitation

Sanitation of a household is reflected by provision of safe drinking water, presence of a latrine, garbage and waste water drains, cleanliness of the surroundings etc. Research shows that inadequate dietary intake alone does not explain the malnutrition. In a study conducted in Burkina Faso (Savy et al., 2005), an association of high food variety and dietary diversity scores with hygiene and sanitation of the house was found. This reflects the same result as seen in our study where adequate sanitation of the house is protective factor for dietary inadequacy OR 0.5 (CI 0.24, 0.91) p<0.05. Sanitation of the house prevents illnesses like diarrhea from taking a hold and contributes to better nutritional status of the population.

12.6.4 Husband Away from Home for More than 6 Months

The current study has found an association of inadequate dietary intake with husband away from home for more than six months (OR 0.6, CI 0.33, 0.95, P<0.05) and this association is protective. This can be explained by the fact that there is some degree of control over finances by the women in situations when living in nuclear family system and if husband is away for work (Rahman et al., 2003a). She can make her own choices of diet and children responsibilities and decision making.

12.6.5 Intimate Partner Violence

Besides physical and psychosocial harm, nutritional status of the women is also affected by Intimate Partner Violence. My study found an association of dietary inadequacy with physical IPV, (OR 1.9 CI 1.03, 3.53, P<0.05). About 79% of pregnant women who had ever experienced physical violence had inadequate diet as compared to those who did not experience physical violence.

It is a major public health problem in Pakistan and 44% of women experience lifetime marital physical abuse (Fikree et al., 2006). One-third of married women report having experienced some form of physical and/or emotional violence by their husbands in the past 12 months (NIPS, 2012).

Findings of a population based study in India also exhibited a dose-response relation, with frequent and recent abuse found to be associated with the highest probability of poor nutritional outcomes, particularly among women. However, the participants were non-pregnant women. The withholding of food is a known form of abuse in Indian households and is perpetrator of physical violence (Ackerson and Subramanian, 2008). A study was conducted in female patients of an urban emergency department to seek association of physical IPV with health behaviors including BMI, diet and exercise. It was observed that as compared to non-victims, the victims were 80% more likely to report daily consumption of unhealthy foods (OR=1.80, p=0.002) (Mathew et al., 2012a). No significant association was observed for BMI and exercise. Another similar study, by Mathew et al in Atlanta, looked for association between intimate partner violence and body mass index (BMI), diet and exercise. There was no significant relationship between

IPV and BMI although IPV victims endorsed less healthy dietary habits (Mathew et al., 2012b).

The difference between these two studies and mine is that these were not community-based; the participants were from an urban background and came to the emergency department for the management of injuries.

It may be concluded that victims who reported eating more quantities of unhealthy foods could be reacting to the increased stress due to IPV in their lives by eating more "comfort" foods that might be unhealthy.

12.6.6 Multidimensional Scale of Perceived Social Support MSPSS

In the present study we established perceived social support of the pregnant women with a self-rating tool of perceived social support received from *Significant Other, Family and Friends.* Results of the study showed that women who had higher scores in social support from significant other, family and friends had less chance of inadequate diet. However, in the final model perceived social support from family is protective for inadequate diet (OR 0.9, CI 0.93-.99 p- 0.040). In a study among men and women Todd used the multidimensional scale of perceived social support (Jackson, 2006). Results of this study showed that women who perceived close relations were highly supportive and reported better dietary practices, higher levels of exercise and health seeking less substance abuse as compared to those who did not perceive support from their close relations. This study is different from mine as it was conducted in an urban setting in the US and the participants were both men and women. Both studies were performed in different cultures and different analysis techniques were used. Very few studies related to dietary intake have used MSPSS as an instrument to assess social support. My study is one of the first population-based studies to have used this instrument to assess perceived support and its association with dietary inadequacy.

12.7 Factors which were Not Significant

Increased age during pregnancy and increased parity have been associated with depression, consequently effecting dietary adequacy, especially that of micronutrients (Hurley et al., 2005). However, in the present study, mother's age was not found to be associated with dietary inadequacy. Some previous studies observed that pregnant women

who are less than thirty years of age and have completed high school, have better quality of diet (Bodnar and Siega-Riz, 2002, Mathew et al., 2012b). But in my study most of the women were educated below high school and were below thirty years of age but we did not find any association with age. Among other maternal factors, number of children, health in last 30 days and number of pregnancies were also found to be significant on univariate analysis. In deposit study (Abu-Saad et al., 2012) the cohort had a mean of 4 children for the rural women but they did not consider parity for association.

Husband's employment, family structure, grandmother living at home and suitable accommodation were all not significant.

Demographic studies reveal that dietary intake is dependent on the type of population and geography (Resano-Mayor et al., 2016). In a survey carried out by American Society of Nutrition, it was found that people belonging to higher socio-economic status tend to consume high quality diets as compared to those who are in the lower socio-economic strata (Darmon and Drewnowski, 2008) and pregnant women with low income are at a higher risk for poor diet quality (Fowles et al., 2012). In present study, similar findings were found to be true, where it is observed that an income of less than Rs.12000 per month, by the husband or the woman herself, results in inadequate dietary intake ($P<0.01$). Likewise, when the woman is financially empowered, there is an increase in adequacy of dietary intake on bivariate analysis ($P<0.01$), however, we were not able to validate these finding on logistic regression analysis.

In another study carried out in Norway, it was concluded that social class creates a barrier in consumption of healthy foods like vegetables and fish. This barrier is due the consumer's own expectations which then takes the form of their habits (Cockerham, 2005). In my study most of the participants were from the poor quintile and were not taking any food group according to the recommended for their group.

A study carried out by Kirkpatrick et al shows that pregnant women belonging to middle and upper socio economic status had insufficient intake of iron and magnesium from dietary sources (Turner et al., 2003). In the same study it was observed that total food expenditure among low-income households was less and they also bought fewer portions of fruits and vegetables as compared to higher-income households (Kirkpatrick

and Tarasuk, 2003). In current study most of the depressed participants did not have enough money for food hence their intake of meat and poultry was less and other expensive food items was less.

Family income and partner's emotional support during pregnancy are associated with low dietary diversity(Hussain and Routray, 2012).

Low literacy levels (68.7% in rural and 36.3% in urban), lack of knowledge and awareness regarding prenatal and antenatal care as well as diet, lack of infrastructure and adequate health services and less gap between pregnancies with more parity are all factors that take a toll on mother's health (Agha Khan University, 2011).

In 2011, the Times magazine presented statistics with regards to purchasing power showing that 46% of a family's income in Pakistan is spent on food as compared to 35% in India (Muhammad et al., 2011). The National Nutrition Survey of Pakistan in 2011 also confirms the above claims of lack of knowledge and awareness by showing that only 50% of rural women seek antenatal care once during their pregnancy and most women have little knowledge about micronutrient deficiencies and their consequences. Only 26.7% women consumed iron and folate and only39% consumed calcium (Agha Khan University, 2011).

The results of this study related to economic variables are similar to the national level findings.

CHAPTER 13

CONCLUSION

13.1 Factors Significant in Both Studies

The aim of the present study was to explore the association of prenatal depression with dietary intake of women in a rural setting of district Rawalpindi Pakistan. In order to achieve this aim, two interrelated studies were conducted for which the data was collected at the baseline of a clustered randomized control trial. In the first section of the study, prevalence of prenatal depression and its risk factors were determined and in the second section, association of prenatal depression and its risk/protective factors with dietary intake of pregnant women was observed. The association of risk prevalence of prenatal depression in this study was 27%, which is consistent with findings of Rahman and colleagues at a similar study site.

The risk/protective factors in each study have been discussed in detail in relevant discussion sections. The factors which were significant in both sections of the study include Satisfaction with life in next 4 years; pregnant women who thought they would be moderately satisfied or dissatisfied with their life were more depressed and had inadequate diet as compared to those who thought they would be satisfied. Second factor associated with prenatal depression and inadequate diet was stressful life events: women in second or third trimester of pregnancy who suffered 3-4 stressful life events in previous year were depressed and had inadequate dietary intake. Stressful life events may vary from mild to severe, depending on how the event is perceived and how well pregnant women can cope with it. Another risk factor identified was Intimate partner violence; women who were psychologically and physically abused by their partners were more likely to be depressed and had inadequate dietary intake. This observation of associations between IPV and prenatal depression could be a matter of concern as certain negative health behaviors including unhealthy dietary practices are associated which subsequently adverse pregnancy outcomes (Sarkar, 2008, Abdollahi et al., 2015).

The fourth factor, which is influential for prenatal depression and dietary inadequacy is maternal perceived and quantitative social support; pregnant women who perceived they had more support from family and friends and received support in every day household chores and children responsibilities were protected from depression and had adequate dietary intake. Suitable household environment and sanitation were also found protective for prenatal depression and inadequate diet.

13.2 Conclusion and recommendations

This study was unique in identifying risk/protective factors which in previous studies were only related to perinatal depression but my study was able to demonstrate that these are also independently associated with dietary intake of pregnant women. This study has great implications for public health action to improve the mental health and nutritional status of pregnant Pakistani women, both problems which are prevalent and modifiable.

The present study, to the best of my knowledge, is the first to investigate the link between prenatal depression and dietary intake, in a large rural community-based sample of women. Previously, community based studies regarding prevalence and risk factors for perinatal depression have been conducted in Pakistan but none measured the association of prenatal depression with maternal dietary intake. However, a few hospital based studies with small urban samples have been published in Pakistan which cannot be generalized for all pregnant women.

We were able to determine the prevalence of depression among pregnant women living in suburban area of Rawalpindi. One fourth of the study population showed depressive symptoms, especially among those who were less educated and were living in joint families. If the women had three or more stressful life events in the past one year, or were abused by an intimate partner, they were more likely to be depressed during pregnancy. Family support, both perceived by the women, and in the form of qualitative and quantitative support in daily household chores and raising kids were found to be protective. There is also a need to examine how depression and the associated factors in turn affect the other biological, cultural and economic consequences including maternal diet.

Most of those who are depressed do not eat variety of items from various food groups to meet the recommended dietary allowance. Prenatal depression is independently associated with inadequate dietary intake based on food variety score. Dietary diversity is important for the women of low income countries like Pakistan as the foods consumed here are not adequate in energy, proteins and other essential nutrients. When assessing the dietary practices of pregnant women, psychosocial factors associated with mental health, were also considered. Maternal satisfaction with life, perceived social support, stressful life events, IPV were the influential factors for prenatal depression and in turn for dietary inadequacy. Interventions focused on social and societal support during pregnancy are needed. Community health workers should be trained to identify depression in groups of women. In antenatal period, women tend to visit health facility for antenatal care or consult a health care provider; it is the ideal time to identify women at risk of depression and malnutrition as well as to provide nutritional counselling as women are more willing during pregnancy to improve their dietary behaviors for better pregnancy outcomes.

The study is important, as nutritionists, practitioner and doctors, when counseling the pregnant women and general population should consider the impact of depression on dietary intake. This research suggests that further measures are required to study the effects of depression on dietary intake and as this phenomenon is not well understood. The cross sectional design of this study prevents the causal inferences about the direction of the relationship between prenatal depression and diet. A longitudinal study will produce significant evidence to further understand this relationship.

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Annex - I

Prenatal Maternal Depression -SCREENINGFORM

SECTION A: Greeting and Introduction تعارف

Introduce yourself, HDRF, the project and the Screening Procedure

1.	Assessor Code …….. انٹرویو کرنے والے کا کوڈ	(S_SC_Assr_Code)
2.	Date of Interview DD/MM/YY…… انٹرویو کی تاریخ	(S_SC_DOI)

SECTION B: Woman's Information عورت کی تفصیل

1	Woman's Name _____ خاتون کا نام	(S_SC_Mo_Name)
2	Husband's Name _____ خاوند کا نام	(S_SC_Hb_Name)
3	UC Name/Code _____ یونین کونسل کا نام/کوڈ	(S_SC_UC_Code)
4	Village Cluster Name/Code _____ گاؤں کا نام	S_SC_Village_Code)
5	Household number _____ گھرانہ نمبر	(S_SC_Hhld_no)

SECTION C: Information and Consent معلومات اور رضامندی

Ensure that the Information sheet has been given or read out aloud to the woman

1	Have you read the information sheet or has it been read to youand you have understood it? آپ نے معلوماتی پرچہ پڑھا ہے یا آپ کو پڑھ کر سنایا گیا ہے۔اور آپ نے اس کو سمجھ لیا ہے؟	Yes 1 ہاں	No 0 نہیں	S_SC_infosheet S_SC_inf
2	Do you agree to be part of the study? کیا آپ اس تحقیق میں شمولیت اختیار کرنے کے لئے رضامند ہیں؟	Yes 1 ہاں	No 0 نہیں	S_SC_consent S_SC_con

SECTION D: Eligibility Criterion اہلیت

1	What is your age (in years). آپ کی عمر کتنی ہے؟ (سالوں میں)	_____	S_SC_Mo_age SSC_mo_age
2	Are you married? کیا آپ شادی شدہ ہیں؟	1: Married شادی شدہ 2: Separated علیحدگی/خُلع 3: Divorced طلاق یافتہ	S_SC_mo_marital_status SSC_mo_status

		4. Widowed بیوہ 5. Unmarried غیر شادی شدہ		
3	Are you in your 2nd or 3rd Trimester of pregnancy **(4TH TO 8TH MONTH)**? کیاآپ حمل کی دوسری یا تیسری سہ ماہی میں ہیں؟(4 سے 8 ماہ تک) یعنی آپ کا کتنوا مہینہ چل رہا ہے؟	Yes 1 ہاں	No 0 نہیں	S_SC_Mo_tri SSC_tri
	Month	_____		S_SC_Mo_tri_months SSC_tri_mon
	days	_____		S_SC_Mo_tri_days SSC_tri_day
4	Do you intend residing in the study area for at least **ONE YEAR**? کیاآپ اس علاقے میں کم از کم ایک سال تک رہیں گی؟	Yes 1 ہاں	No 0 نہیں	S_SC_Mo_stay SSC_mo_stay
5	Can you speak & understand Urdu, Potohari, Punjabi and English? کیاآپ اُردو، پوٹھوہاری، پنجابی اور انگریزی بول یا سمجھ سکتی ہیں؟	Yes 1 ہاں	No 0 نہیں	S_SC_Mo_lang SSC_mo_lang
6	Note if the woman requires immediate inpatient care for any reason (medical or psychiatric). (Assessors Observation)	Yes 1 ہاں	No 0 نہیں	S_SC_mo_inp_care SSC_mo_care

SECTION E: PATIENT HEALTH QUESTIONNAIRE (PHQ-9) مریض کی صحت کے لئے سوالنامہ

Now I will be asking you questions about your health (physical & mental health)
Now tell me
"Over the last 2 weeks, how often have you been bothered by any of the following problems?
پچھلے دو ہفتوں کے دوران آپ کو مندرجہ ذیل مشکلات نے کتنی بار پریشان کیا

1	Feeling tired or having little energy. تھکاوٹ اور جسمانی توانائی میں کمی محسوس ہوئی	0---Not at all بالکل نہیں 1---Several days کئی دن 2--- More than half the days آدھے دنوں سے زیادہ 3--- Nearly every day تقریباً ہر روز	(S_SC_PHQ_lethargy) SSC_PHQ1
2	Poor appetite or overeating. بھوک کی کمی یا زیادتی	0---Not at all بالکل نہیں 1---Several days کئی دن 2--- More than half the days آدھے دنوں سے زیادہ	(S_SC_PHQ9_appetite) SSC_PHQ2

		3--- Nearly every day تقریباً ہر روز	
3	Trouble falling or staying asleep, or sleeping too much. صحیح نیندنہ آنا' نیند میں کمی یا زیادتی	0---Not at all بالکل نہیں 1---Several days کئی دن 2--- More than half the days آدھے دنوں سے زیادہ 3--- Nearly every day تقریباً ہر روز	(S_SC_PHQ9_sleep) SSC_PHQ3
4	Moving speaking so slowly that other people could have noticed. Or the opposite being so fidgety or restless that you have been moving around a lot more than usual. بات چیت کام کاج میں سستی یا بے چینی جو دوسروں نے بھی محسوس کی ہو یا پھر طبیعت میں بے چینی کی وجہ سے بہت زیادہ پریشان رہی ہو؟	0---Not at all بالکل نہیں 1---Several days کئی دن 2--- More than half the days آدھے دنوں سے زیادہ 3--- Nearly every day تقریباً ہر روز	(S_SC_PHQ9_psychomotor_retardation) SSC_PHQ4
5	Trouble concentrating on things، such as reading the newspaper or watching television. کام پرتوجہ نہ دینامثلاً چیزیں رکھ کے بھول جانایاہانڈی میں نمک ڈالنا بھول جانا' اخبار پڑھتے ہوئے اور TV دیکھتے ہوئے توجہ مرکوزنہ ہونا۔	0---Not at all بالکل نہیں 1---Several days کئی دن 2--- More than half the days آدھے دنوں سے زیادہ 3--- Nearly every day تقریباً ہر روز	(S_SC_PHQ9_lossofconcentration) SSC_PHQ5
6	Little interest or pleasure in doing things- کام میں دل نہ لگتا ہو (پہلے جن کاموں میں دل لگتا تھا مگر اب نہیں لگتا)	0---Not at all بالکل نہیں 1---Several days کئی دن 2--- More than half the days آدھے دنوں سے زیادہ 3--- Nearly every day تقریباً ہر روز	(S_SC_PHQ9_lossofinterest) SSC_PHQ6
7	Feeling down, depressed, or hopeless. صحت گری گری رہتی ہو'خفگان/دل خفا رہنا/ خفگی ذھنی دباؤیا نا امید ہونا	0---Not at all بالکل نہیں 1---Several days کئی دن 2--- More than half the days آدھے دنوں سے زیادہ 3--- Nearly every day	(S_SC_PHQ9_lossofpleasure) SSC_PHQ7

		تقریباً ہر روز	
8	Feeling bad about yourself or that you are a failure or have let yourself or your family down- اپنا آپ برا لگنا یا ایسامحسوس ہوناکہ آپ اپنی اوراپنےخاندان کی امیدوں پر پورا نہیں اتر پائیں۔	0---Not at all بالکل نہیں 1---Several days کئی دن 2--- More than half the days آدھے دنوں سے زیادہ 3--- Nearly every day تقریباً ہر روز	(S_SC_PHQ9_guilt) SSC_PHQ8
9	Thoughts that you would be better off dead, or of hurting yourself- خود کو نقصان پہنچانے کا سوچنا یا ایسا سوچنا کے مر جانا بہتر ہے۔	0---Not at all بالکل نہیں 1---Several days کئی دن 2--- More than half the days آدھے دنوں سے زیادہ 3--- Nearly every day تقریباً ہر روز	(S_SC_PHQ9_Suicidality) SSC_PHQ9
10	If you had any of above problems, how difficult these problems made it for you to do your work, take care of things at home, or get along with other people? اگرآپکوان مشکلات کا سامناکرناپڑاہےتوانکی وجہ سے گھرکےکام کاج' گھرکی چیزوں کی دیکھ بھال یا لوگوں کےساتھ ملنےجلنے میں کتنی مشکل محسوس ہوئی؟	Not difficult at all: 1 بالکل مشکل نہیں ہوئی Somewhat difficult: 2 تھوڑی مشکل ہوئی Very difficult: 3 بہت مشکل ہوئی۔ Extremely difficult: 4 انتہائی مشکل ہوئی Not Applicable: 9 لاگو نہیں ہوتا	S_SC_PHQ9_difficulty SSC_PHQ10
11	PHQ-9 Total Score	*Scores of 1 to 9 to be added*	(S_SC_PHQ9_Total) SSC_PHQttl

PRENATAL MATERNAL DEPRESSION SYMPTOMS AND DIETARY INTAKE

BASELINE QUESTIONNAIRE

SECTION A: GREETING AND INTRODUCTION

Introduce yourself, HDRF, the project and the Baseline procedure

1.	Assessor Code …… انٹرویو کرنے والے کا کوڈ	(S_SC_Assr_Code)
2.	Date of Interview DD/MM/YY…… انٹرویو کی تاریخ	(S_SC_DOI)

SECTION B: Woman's Information عورت کی تفصیل

1.	Woman's Name _____ خاتون کا نام	(S_SC_Mo_Name)
2.	Husband's Name _____ خاوند کا نام	(S_SC_Hb_Name)

SECTION C: Information and Consent معلومات اور رضامندی

Ensure that the Information sheet has been given or read out aloud to the woman

Prompt: Is woman depressed?

0---No

1---Yes

1.	Have you read the SHARE THPP information sheet and understood it? آپ نے معلوماتی پرچہ پڑھا ہے یا آپ کو پڑھ کر سنایا گیا ہے اور آپ نے اس کو سمجھ لیا ہے؟	Yes 1 ہاں	No 0 نہیں	S_SC_infosheet_SHARETHPP S_SC_inf
1.1	Do you consent to be the part of SHARE THPP?? کیا آپ اس تحقیق میں شمولیت اختیار کرنے کے لئے رضامند ہیں؟	Yes 1 ہاں	No 0 نہیں	S_SC_consent_SHARETHPP S_SC_con
2.	Have you read the SHARE CHILD information sheet and understood it? آپ نے معلوماتی پرچہ پڑھا ہے یا آپ کو پڑھ کر سنایا گیا ہے۔اور آپ نے اس کو سمجھ لیا ہے؟	Yes 1 ہاں	No 0 نہیں	S_SC_Infosheet_SHARECHILD SC_inf
2.1	Do you consent to be the part of SHARE CHILD?? کیا آپ اس تحقیق میں شمولیت اختیار کرنے کے لئے رضامند ہیں؟	Yes 1 ہاں	No 0 نہیں	S_SC_consent_SHARECHILD SC_con

SECTION D: PERSONAL INFORMATION QUESTIONNAIRE ذاتی معلومات کا سوالنامہ

Now I would like to ask you a few questions about you and your household.

اب میں آپ اور آپکے گھرانے کے بارے میں کچھ تفصیل حاصل کروں گی۔

Woman Height. (Cm.)	_____	SC_Womanheight_cm SC_mo_ht
Woman's Weight. (kg)	_____	SC_Womanweight SC_mo_wt
Woman's Waist Circumference. (Inch.)	_____	SC_Womanwaist SC_mo_wst

Woman's Blood Pressure (upper range/lower range mmHg)	_____	SC_WomanBP SC_mo_bp
1. The place where you are residing now, Is this your natal or marital home? ابھی آپ اپنے میکے میں ہیں یا سسرال میں ہیں؟	1--- Natal Home میکہ 2--- Marital Home سسرال	S_SC_current_residinghome SC_mo_hom
2. What is the structure of your marital family? آپکا خاندانی نظام کیا ہے؟(آپ لوگ ایک ہی چولھے سے کھانا کھاتے ہیں یا الگ الگ چولھے سے؟) *1 a. Do you all (father-in-law, mother-in-law, sister-in-lawetc.) Live together.* *1 b. If Yes do you share the same kitchen?* *If Yes to both, 1a and 1b, rate 1.* *If Yes to 1a question and No to 1b, rate 2.*	0 -- Nuclear الگ 1 --Joint/extended مشترکہ 2-- Multiple households ایک گھر میں ایک سے زائد چولہے' ایک گھر میں رہتے ہوئے الگ الگ کھانا پکانا۔	S_SC_family_Structure SSC_fm_st
3. Does the child's grandmother live with them? بچوں کی نانی/دادی بچوں کے ساتھ رہتی ہیں؟	0 --- No نہیں 1---Yes ہاں	S_SC_grandmother SC_gmo
4. What is your usual place of residence? کیا آپکا گھر اپنا ہے یا کرائے کا؟	1-- Owned house اپنا گھر 2 -- Rented house کرائے کا 3 --Officially/Government allotted house سرکاری 4 --Other _____ اس کے علاوہ یا کوئی اور	SC_usual_residence SC_mo_res
5.How many rooms do you have in this house? اس گھر میں کتنے کمرے ہیں؟	_____	SC_Rooms_in_house SC_rms
6. How many adults live in your marital home and Who? آپ کے سسرال میں کتنے بالغ رہتے ہیں اور کون کون رہتا ہے؟	1. Woman (respondent)	SC_No_of_adults_respondent SC_mo
	2. Husband	SC_No_of_adults_husb SC_hus
	3. Mother-in-Law	SC_No_of_adults_mothinlaw SC_molaw
	4. Father-in-Law	SC_No_of_adults_fatherinlaw SC_falaw
	5. Brother-in-Law	SC_No_of_adults_broinlaw SC_brolaw
	_____	SC_No_of_adults_broinlaw_numbers SC_brolaw_num
	6. Sister-in-Law	SC_No_of_adults_sisinlaw SC_sislaw

	_____	SC_No_of_adults_sisinlaw _numbers SC_sislaw_nmbr
	7.Others	SC_No_of_adults_others SC_othr
	_____	SC_No_of_adults_others_ numbers SC_othr _nmbr
7. How many children (under 18) live here? کتنے بچے 18سال سے کم عمر کے ہیں؟	Number of Boys	SC_No_of_boys SC_boys
	Number of Girls	SC_No_of_girls SC_girls
8. Do you consider the accommodation adequate and suitable for raising a small child? کیاآپکے خیال میں یہ جگہ چھوٹے بچے کی نشوونما کیلئے مناسب ہے؟ *(Prompts: lots of stairs, heating, safe area to play, well)* (کنواں، سیڑھیاں، آگ جلانے کی جگہ، کھیل کی محفوظ جگہ وغیرہ)	0---No نہیں 1---Yes ہاں 2--Do not Know معلوم نہیں	SC_adeq_env_child SC_ad_accom
9. Does the accommodation have adequate sanitation? کیااس جگہ نکاسی آب کا مناسب انتظام ہے؟ (Prompts: safe/clean drinking water, risk of infection) (پینے کا صاف پانی، ڈھکی ہوئی نالیاں وغیرہ)	0---No نہیں 1---Yes ہاں 2--Do not Know معلوم نہیں	SC_adeq_env_child SC_ad_san
10. Does your husband normally work? کیاآپکے خاوند کام کرتے ہیں؟	0---No نہیں 1---Yes ہاں	S_SC_husb_work_status SSC_hus_wrk
10 a. What is his occupation? آپکے خاوند کیاکام کرتے ہیں؟	1--Manual worker (e.g. factory worker, farmer, laborer, driver, shopkeeper, cook, cleaner) 2--Non-manual worker (e.g. teacher, clerk etc.) 3 – Others_____	S_SC_husb_occupation SSC_hus_occ
10 b. What is his average monthly income? ان کی ماہانہ آمدنی کتنی ہے؟	_____ 2 – Do not know معلوم نہیں	S_husb_mnthly_inc SSC_hus_in
11. In the past 6 months has your husband been away continuously from home for work for a month or more? پچھلے چھ مہینے میں آپ کے خاوند کام کے سلسلے میں	0---No نہیں 1---Yes ہاں _____	SC_husb_away_monthly SC_hus_away

مسلسل ایک مہینے یا اس سے زیادہ گھر سے باہر رہے؟		
11 a. How many months? کتنے مہینے؟		SC_husb_away_monthnumbers SC_hus_away_mnt
11 b. Are there any days per week that your husband is continuously away from home for work? کیا آپکے خاوند ہفتے میں کچھ دن کام کے سلسلے میں مسلسل گھر سے باہر رہتے ہیں؟	0---No نہیں 1---Yes ہاں	SC_husb_away_weekly SC_ hus_away_wk
11 c. How many days? کتنے دن؟		SC_husb_away_weeknumbers SC_ hus_away_dy
12. Do you normally work? کیا آپ کام کرتی ہیں؟ آپ گھر کے کام کاج کے علاوہ کوئی اور کام کرتی ہیں؟	0---No نہیں 1---Yes ہاں	S_SC_wife_work_status SSC_mo_wrk
12 a. What is your occupation? اگر ہاں تو آپ کس قسم کا کام کرتی ہیں؟	1--Manual worker (e.g. factory worker, farmer, laborer, driver, shopkeeper, cook, cleaner) 2--Non-manual worker (e.g. teacher, clerk, home tuition etc.) 3 – Others _____	S_SC_wife_occupation SSC_mo_occ
12 b. What is your average monthly Income? آپ کی ماہانہ آمدنی کتنی ہے؟		S_wife_income S_mom_in
13. Does your husband/head of family give you spending money? If yes, do you decide how to spend this money? If yes to both, rate 1. کیا آپ کے شوہر یا گھر کے سربراہ آپکو گھر کے خرچے کے علاوہ پیسے دیتے ہیں؟ اگر ہاں، تو آپ ان پیسوں کو اپنی مرضی سے خرچ کرتی ہیں؟	0-- Not Empowered 1-- Empowered	SC_wife_empowerment_status SC_mo_emp
14. What is your household's <u>total</u> monthly income *(if apart from the wife and husband someone else in the house also works)?* آپ کے گھرانے کی کل آمدن کتنی ہے؟	_____ 2--Do not Know معلوم نہیں	SC_total_income SC_ttlincm
15. How has your overall health been in	1. Very Good بہت اچھی	SC_30days_health

the past 30 days? پچھلے تیس دنوں میں آپکی عمومی صحت کیسی رہی؟	2. Good اچھی 3. Moderate درمیانی 4. Bad خراب 5. Very Bad بہت خراب	SC_mo_mthhlth
16. Have you ever been so unwell that your husband or close family member(s) had to STOP his/her work? کیاآپ کی طبعیت اتنی خراب ہوئی جس کی وجہ سے آپ کے شوہر یاآپ کے کسی قریبی رشتے دار کو اپنا کام چھوڑنا پڑا ہو (جیسے کے گھر کا کام، نوکری یا دھاڑی وغیرہ)	0--No نہیں 1--Yes ہاں	SC_unwell SC_unwell_stpwrk
17. How many grades have you passed? آپ نے کتنی جماعتیں پاس کی ہیں؟	No. of years _____ سالوں میں	S_SC_wife_years_education SSC_moedctn
18. How many grades has your husband passed? آپ کے خاوند نے کتنی جماعتیں پاس کی ہیں؟	No. of years _____ سالوں میں	S_SC_husb_years_education SSC_hsbedctn
Now I am going to ask you a few questions about your pregnancy اب میں آپ سے آپ کے حمل کے بارے میں کچھ سوال پوچھوں گی۔		
19. Including this pregnancy, how many times have you been pregnant? آپ کتنی بار حاملہ ہو چکی ہیں اس حمل کو شامل کرتے ہوئے؟	_____	S_SC_pregnancy SSC_prgntnmbr
19a.How many miscarriages did you have?؟آپ کے کتنے حمل ضائع ہوئے	_____	S_SC_miscarriage SSC_mscrrg
19b.How many still births did you have?؟آپ کے کتنے بچے مردہ پیدا ہوئے	_____	S_SC_stillbirth SSC_stlbrth
19c.How many children who were alive at birth died that were under 1 years of age? (آپکے کتنے بچے ایک سال سے کم عمر میں فوت ہوئے؟ جو پیدائش کے وقت زندہ تھے)۔	Boys _____	S_SC_mortalityunder1_boys SSC_mrtltyboys1
	Girls _____	S_SC_mortalityunder1_girls SSC_mrtltygirls1
19d. How many children died that were between 1 and 5 years of age? آپ کے کتنے بچے ایک سال سے اوپر اور پانچ سال سے کم میں فوت ہوئے؟	Boys _____	S_SC_mortalitybtw1n5_boys SSC_mrtltyboys5
	Girls _____	S_SC_mortalitybtw1n5_girls SSC_mrtltygrls5

19e.How many living children do you have?? آپ کے زندہ بچے کتنے ہیں؟	_____	S_SC_livingchildren SSC_chldrnnmbr
19e (i). How many are boys and girls out of them? ان میں سے کتنی لڑکیاں اور کتنے لڑکے ہیں؟	Boys _____	S_SC_livingchildren_boys SSC_childrnbys
	Girls _____	S SC_livingchildren_girls SSC_chldrngrls
19e (ii). Tell their ages starting from eldest one.*(in years)* سب سے بڑے سے چھوٹے تک عمر بتاتی جائیں۔		S_SC_age_child1
		S_SC_age_child2
		S_SC_age_child3
		S_SC_age_child4
		S_SC_age_child5
		S_SC_age_child6
		S_SC_age_child7
		S_SC_age_child8
		S_SC_age_child9
		S_SC_age_child10
		S_SC_age_child11
		S_SC_age_child12
		S_SC_age_child13
		S_SC_age_child14
		S_SC_age_child15
19f.Where did you deliver your last child? آپ کے آخری بچے کی پیدائش کہاں ہوئی؟	1 --- Hospital 2 --- House 3--- Others_____	S_SC_delivery_location_lst child SSC_dlvrylctn
20. How many children would you/like to have? How many of these should be boys and girls? آپ کے خیال میں آپ کے کتنے بچے ہونے چاہیئے ان میں سے کتنے لڑکے ہوں اور کتنی لڑکیاں ہوں؟	1--- Number of Boysلڑکے	SC_idealchildren_boys SC_idlboys
	2---Number of Girlsلڑکیاں	SC_idealchildren_girls SC_idlgrls
	3---Allah's willاللہ کی مرضی جو اللہ کو منظور ہو	SC_idealchildren_willofGod SC_idlchldallah
	4----Don't Knowمعلوم نہیں	SC_idealchildren_dontknow SC_idlchld_dntknw

21. Do you plan to use contraception or any other sort of family planning method to delay or avoid pregnancy at any time in the future? کیاآپ مستقبل میں بچوں میں وقفے کے لیے کوئی طریقہ استعمال کرنے کے بارے میں سوچ رہیں ہیں؟	0---No نہیں 1---Yes ہاں 2---Don't Know معلوم نہیں	SC_Contrcptv_plan SC_cntrcppln
21a. After this child how long would you like to wait from now before the birth of the next child? اس بچے کے بعداب آپ اگلے بچے کی پیدائش میں کتنا وقفہ دینا چاہیں گی؟	1---Months_____مہینے	SC_ Contrcptv_planduration_mths SC_cntrcp_mth
	2---Soon/Now اس کے فورابعد	SC_ Contrcptv_planduration_soonnow SC_cntrcp_sn
	3----Allah's will اللہ کی مرضی جواللہ کو منظور ہو	SC_ Contrcptv_planduration_ Allahwill SC_cntrcp_allah
	4---Don't know معلوم نہیں	SC_ Contrcptv_planduration_donotknow SC_contrcp_dnk
	5--NA (please specify) اور کوئی وجہ	SC_ Contrcptv_planduration_ Notapplicable_others SC_contrcp_na
22. Where on a scale of 1-5 would you say your life satisfaction lies? آپ اپنی زندگی سے کتنی مطمئن ہیں؟	1. Very satisfied بہت مطمئن 2. Satisfied مطمئن 3. Moderately satisfied درمیانی 4. Dissatisfied غیر مطمئن 5. Very dissatisfied بہت غیر مطمئن	SC_life_satisfaction SC_lfstsfctnnw
22a. Where on that scale do you think you will be in 4 years? اس لحاظ سے آپ اگلے چار سالوں میں اپنے آپ کو کیسا/ کہاں دیکھتی ہیں؟	6. Very satisfied بہت مطمئن 7. Satisfied مطمئن 8. Moderately satisfied درمیانی 9. Dissatisfied غیر مطمئن Very dissatisfied بہت غیر مطمئن 6. Allah's will اللہ کی مرضی جواللہ کو منظور ہو 7. Do not know معلوم نہیں	SC_life_satisfaction_4years SC_lfstsfctn4yrs

23. To what age do you expect you will live? آپ کیا امید کرتی ہیں کہ آپ کی زندگی/عمر کتنی لمبی ہو گی؟	1--- 40-49 2--- 50-59 3---60-69 4---70-79 5--- 80 & above 6---Allah's will 7---Do not know	SC_life_expectancy SC_lfexpctncy
24. How many times did you pray yesterday? آپ نے کل کتنی بار دعا مانگی/پڑھی/کی؟ آپ نے کل کتنی نمازیں پڑھیں؟ (رب سے بات کرنا/رب سے تعلق قائم کرنا)	_____	SC_noofprayers SC_pryrs
25. My faith give me strength. میرا ایمان/یقین/عقیدہ مجھے تقویت/طاقت/حوصلہ دیتا ہے۔	0--- No 1--- Sometimes 2--- Yes	SC_faith_degreeofstrength SC_fthstrnth

SECTION E: ASSETS RELATED QUESTIONS

1. Do you or your household members own or rent any land for farming? کیا آپکے پاس یا آپکے گھر میں کسی کے پاس کھیتی باڑی کے لئے زمین ہے؟	0--No نہیں 1--Yes owned ہاں، ملکیت ہے 2--Yes rented ہاں، ٹھیکے یا کرائے پر ہے	S_SC_assets_farming SSC_assts1
1a. What do you do with the crop that is grown **most** of the time? زیادہ تر پیدا ہونے والی فصل کا آپ کیا کرتے ہیں؟	1--Mostly for own consumption خود استعمال کرتے ہیں 2--Mostly for sale بیچ دیتے ہیں 3--Mixture of both خود بھی استعمال کرتے ہیں اور بیچتے بھی ہیں۔	S_SC_assets_crop_usage SSC_assts1a
2. Do you or household members own animals? کیا آپ یا آپ کے گھر والوں میں سے کسی کے پاس جانور ہیں؟	0-- No نہیں 1--Yes ہاں	S_SC_assets_livestock_own SSC_assts2
2a. How many of the following animals do you or your household members own? آپ یا آپ کے گھر والوں کے پاس مندرجہ ذیل جانوروں میں سے کون سے اور کتنے جانور ہیں؟		
2a(i).Chickens مرغیاں	_____	S_SC_assets_livestock_chicken

		SSC_assts2a
2a (ii).Sheep/goats بکریاں/بھیڑ	_____	S_SC_assets_livestock_sheep_goat SSC_assts2b
2a (iii).Cows/buffaloes بھینسیں/گائے	_____	S_SC_assets_livestock_cow_buffaloes SSC_assts2c
2a(i).Chickens مرغیاں	_____	S_SC_assets_livestock_chicken SSC_assts2a
2a (ii).Sheep/goats بکریاں/بھیڑ	_____	S_SC_assets_livestock_sheep_goat SSC_assts2b
2a (iii).Cows/buffaloes بھینسیں/گائے	_____	S_SC_assets_livestock_cow_buffaloes SSC_assts2c
3. Which of the following do you presently have in your household? ان میں سے کون سی چیزیں آپ کے گھر میں موجود ہیں؟		
3a.Electricity connection بجلی کا کنکشن	0-- No نہیں 1--Yes ہاں	S_SC_assets_electricty SSC_assts3a
3b.Radio ریڈیو	0-- No نہیں 1--Yes ہاں	S_SC_assets_radio SSC_assts3b
3c.Television ٹیلیویژن	0-- No نہیں 1--Yes ہاں	S_SC_assets_television SSC_assts3c
3d.Telephone or Mobile ٹیلیفون یا موبائل	0-- No نہیں 1--Yes ہاں	S_SC_assets_telephone_mobile SSC_assts3d
3e.Fridge فریج	0-- No نہیں 1--Yes ہاں	S_SC_assets_fridge SSC_assts3e
3f.Washing machine کپڑے دھونے والی مشین	0-- No نہیں 1--Yes ہاں	S_SC_assets_washingmachine SSC_assts3f

3g.Water pump (electric or manual) پانی کی موٹر	0-- No نہیں 1--Yes ہاں	S_SC_assets_waterpump SSC_assts3g
3h.Bed پلنگ	0-- No نہیں 1--Yes ہاں	S_SC_assets_bed SSC_assts3h
3i.Chair کرسی	0-- No نہیں 1--Yes ہاں	S_SC_assets_chair SSC_assts3i
3j.Cabinet/ cupboard الماری	0-- No نہیں 1--Yes ہاں	S_SC_assets_cabinet_cupboard SSC_assts3j
3k.Clock گھڑی	0-- No نہیں 1--Yes ہاں	S_SC_assets_clock SSC_assts3k
3l.Sofa صوفہ	0-- No نہیں 1--Yes ہاں	S_SC_assets_sofa SSC_assts3l
3m.Sewing machine سلائی مشین	0-- No نہیں 1--Yes ہاں	S_SC_assets_sewingmachine SSC_assts3m
3n.Camera کیمرہ	0-- No نہیں 1--Yes ہاں	S_SC_assets_camera SSC_assts3n
3o.Laptop/computer/tablet لیپ ٹاپ/کمپیوٹر	0-- No نہیں 1--Yes ہاں	S_SC_assets_laptop_computer_tablet SSC_assts3o
3p.Wrist-watch ہاتھ میں باندھنے والی گھڑی	0-- No نہیں 1--Yes ہاں	S_SC_assets_wristwatch SSC_assts3p
3q.Bicycle سائیکل	0-- No نہیں 1--Yes ہاں	S_SC_assets_bicycle SSC_assts3q
3r.Motorcycle/ scooter/ motorized 2 wheeler موٹرسائیکل یا سکوٹر	0-- No نہیں 1--Yes ہاں	S_SC_assets_motorcycle SSC_assts3r
3s.Car/truck/tractor گاڑی،ٹرک یا ٹریکٹر	0-- No نہیں 1--Yes ہاں	S_SC_assets_car SSC_assts3s
3t.Animal drawn cart گھوڑاگاڑی، گدھاگاڑی یا بیل گاڑی	0-- No نہیں 1--Yes ہاں	S_SC_assets_animalcart SSC_assts3t

4. What is the main source of drinking water for your household? آپکے گھر میں پینے کا پانی کہاں سے آتا ہے؟		
4a. Piped drinking water into household (any source of piped water) پائپ سے	0-- No نہیں 1--Yes ہاں	S_SC_assets_drinkingwater_piped SSC_assts4a
4b. Public Tap سرکاری نل سے	0-- No نہیں 1--Yes ہاں	S_SC_ assets_drinkingwater_publictap SSC_assts4b
4c. Hand-pump/Tube Well/Bore Hole ہینڈ پمپ،ٹیوب ویل یا بور سے	0-- No نہیں 1--Yes ہاں	S_SC_ assets_drinkingwater_handpump SSC_assts4c
4d. Covered well ڈھکے ہوئے کنوئیں سے	0-- No نہیں 1--Yes ہاں	S_SC_ assets_drinkingwater_coveredwell SSC_assts4d
4e. Open well کھلے کنوئیں سے	0-- No نہیں 1--Yes ہاں	S_SC_ assets_drinkingwater_openwell SSC_assts4e
4f. Surface water e.g. river, lake تالاب یا چھپّر سے	0-- No نہیں 1--Yes ہاں	S_SC_ assets_drinkingwater_surfacewater SSC_assts4f
4g. Tanker or truck that comes to the house پانی والا ٹینکر یا ٹرک گھر آتا ہے	0-- No نہیں 1--Yes ہاں	S_SC_ assets_drinkingwater_tanker SSC_assts4g
4h. Collected rain water in bucket/tank بارش کا پانی بالٹی یا ٹینکی میں جمع کرتے ہیں	0-- No نہیں 1--Yes ہاں	S_SC_ assets_drinkingwater_collectedwater SSC_assts4h
4i. Bottled Water بوتل کا پانی	0-- No نہیں	S_SC_ assets_drinkingwater_bo

	1--Yes ہاں	ttledwater SSC_assts4i
5. What kind of toilet facility do adults in your household usually use? آپکے گھر میں بڑے کس قسم کی لیٹرین استعمال کرتے ہیں؟		
5a.Bush, field, outdoor space جھاڑی، کھیت یا فصلوں میں	0-- No نہیں 1--Yes ہاں	S_SC_ assets_toilet_outdoor SSC_assts5a
5b.Pit latrine ٹوئے والی لیٹرین	0-- No نہیں 1--Yes ہاں	S_SC_ assets_toilet_pitlatrine SSC_assts5b
5c.Flush toilet فلش والی لیٹرین	0-- No نہیں 1--Yes ہاں	S_SC_ assets_toilet_flushtoilet SSC_assts5c
6. What is the MAIN type of fuel used for cooking in your household? آپ گھر میں کھانا پکانے کے لئے کیا جلاتے ہیں؟		
6a.Firewood/ wood لکڑی	0-- No نہیں 1--Yes ہاں	S_SC_ assets_cookingfuel_wood SSC_assts6a
6b.Crop residue/Straw/Grass/ Dung پاتھیاں یا گھاس	0-- No نہیں 1--Yes ہاں	S_SC_ assets_cookingfuel_residue SSC_assts6b
6c.Kerosene مٹی کا تیل	0-- No نہیں 1--Yes ہاں	S_SC_ assets_cookingfuel_kerosene SSC_assts6c
6d.Charcoal/ coal کوئلہ	0-- No نہیں 1--Yes ہاں	S_SC_ assets_cookingfuel_coal SSC_assts6d

6e.Gas cylinder (LPG) or piped natural gas (Sui gas) ایل پی جی سیلنڈر یا سوئی گیس	0-- No نہیں 1--Yes ہاں	S_SC_ assets_cookingfuel_gas SSC_assts6e
Now look at the house and record what type of roof, walls, and floor the house is PREDOMINANTLY made of:		
7. Roof of the house is predominantly (tick one) made of گھر کی چھت کس چیز سے بنی ہے؟		
7a. T-iron/ wood/ brick گارڈر والی یا لکڑی والی چھت		S_SC_ assets_roof_wood SSC_assts7a
7b. Reinforced brick cement/ concrete cement لینٹر والی چھت		S_SC_ assets_roof_cement SSC_assts7b
7c. Asbestos/Iron sheets لوہے یا سیمنٹ کی چادر		S_SC_ assets_roof_asbestos SSC_assts7c
7d. Thatch/ Hay ٹہنیاں،شاخوں یا پتوں کی چھت		S_SC_ assets_roof_thatch SSC_assts7d
7d. Thatch/ Hay ٹہنیاں،شاخوں یا پتوں کی چھت		S_SC_ assets_roof_thatch SSC_assts7d
8. Walls of the house are **PREDOMINANTLY***(tick one)* made of گھر کی دیوار کس چیز سے بنی ہے؟		
8a. Unbaked bricks & mud کچی دیوار اور گارے سے		S_SC_ assets_walls_mud SSC_assts8a
8b. Baked bricks or cement blocks پکی اینٹ اور سیمنٹ سے		S_SC_ assets_walls_bricks SSC_assts8b
8c. Stones & mud پتھر اور گارے سے		S_SC_ assets_walls_stonemud

		SSC_assts8c
8d. Stone blocks پتھر کے بلاکس سے		S_SC_ assets_walls_ stoneblocks SSC_assts8d
9. Floor of the house is **PREDOMINANTLY***(tick one)* made of گھر کا فرش کس چیز سے بنا ہے؟		
9a. Mud گارے سے		S_SC_ assets_floor_mud SSC_assts9a
9b. Cement سیمنٹ/سلیک سے		S_SC_ assets_floor_cement SSC_assts9b
9c. Bricks اینٹوں سے		S_SC_ assets_floor_bricks SSC_assts9c
9d. Chips/ terazzo چپس سے		S_SC_ assets_floor_chips SSC_assts9d
9e. Ceramic tiles ٹائلوں سے		S_SC_ assets_floor_ceramic_tiles SSC_assts9e

SECTION F: SOCIO-ECONOMIC STATUS

1. Do you have enough money to meet the basic needs of your family? کیا آپ کے پاس اتنے پیسے ہوتے ہیں کہ آپ اپنی بنیادی ضرورتیں پوری کر سکیں؟	0-- No نہیں 1-- Yes ہاں 2-- Do not Know معلوم نہیں	SC_socioecon_money_basicneeds SC_scecn1
2. In the last month, did you have sufficient money to buy food for your family? پچھلے ایک مہینے میں کیا آپ کے پاس خوراک خریدنے کیلئے پیسے تھے؟	0—No نہیں 1-- Yes ہاں 2-- Do not Know معلوم نہیں	S_SC_socioecon_money_food SC_scecn2
3. In last month, how much was the total expenditure of this family? پچھلے ماہ آپ کا کل کتنا خرچا ہوا تھا؟	_____ 2-Do not Know معلوم نہیں	S_SC_socioecon_total_expenditure SC_scecn3
4. In the last month, about how much did this family spend on food expenses? پچھلے ماہ میں آپ نے خوراک راشن خریدنے کے لئے کتنے پیسے	_____ 2-Do not Know معلوم نہیں	SC_socioecon_foodexpenses SC_scecn4

خرچ کئے؟		
5. In the last week, about how much did this family spend on health or medical needs? پچھلے ایک ہفتے میں آپ نے علاج معالجے پر کتنے پیسے خرچ کئے؟	_____ 2-Do not Know معلوم نہیں	SC_socioecon_healthexpenditure_lastweek SC_scecn5
6. In the last month, about how much did this family spend on health or medical needs? پچھلے ایک ماہ میں آپ نے علاج معالجے پر کتنے پیسے خرچ کئے؟	_____ 2-Do not Know معلوم نہیں	SC_socioecon_healthexpenditure_lastmonth SC_scecn6
7. In the last month, about how much did this family spend on things related to education? پچھلے ایک مہینے میں آپ نے تعلیم پر کتنے پیسے خرچ کئے؟	_____ 2-Do not Know معلوم نہیں	SC_socioecon_educationexpenditure SC_scecn7
8. Are you or your family in debt? کیا آپ یا آپ کے خاندان پر کوئی قرضہ ہے؟	0-- No نہیں 1-- Yes ہاں 2-- Do not Know معلوم نہیں	S_SC_socioecon_debt SSC_scecn8

SECTION G: DECISION MAKING QUESTIONS/AUTONOMY

I am now going to ask you some questions about your work, and how decisions are made in your home.

اب میں آپ سے آپ کے کام یا آپ کے گھر میں لئے جانے والے فیصلوں کے حوالے سے کچھ سوال کروں گی۔

1. Aside from housework (for example, cooking, cleaning, washing clothes, feeding and bathing children, collecting water, firewood, etc.) have you done any work in the last 12 months? پچھلے 12 مہینوں میں آپ نے گھر کے کام کاج (مثلاً گھر کی صفائی، کپڑوں کی دھلائی، پانی بھرنا، اپنے بچوں کی دیکھ بھال وغیرہ) کے علاوہ کوئی اور کام کیا؟	0---No نہیں 1---Yes ہاں	S_SC_Autonomy_work SSC_autnmy1
1a. In the last 12 months, have you received any cash for the work that you have done? پچھلے 12 مہینوں میں آپ نے اس قسم کا کوئی کام کیا ہے جس کے بدلے آپکو پیسے ملے؟	0---No نہیں 1---Yes ہاں	S_SC_Autonomy_workcash SSC_autnmy1a
1b. In the last 12 months, have you received any compensation other than money for the work that you have	0---No نہیں 1---Yes ہاں	S_SC_Autonomy_recievedcompendationforwork

done? پچھلے 12 مہینوں میں آپ نے اس قسم کا کوئی کام کیا ہے جس کے بدلے آپ کو پیسوں کی جگہ اشیاء ملیں؟		SSC_autnmy1b
2. Who decides how the money you earn or the goods that you receive will be spent or used? یہ فیصلہ کون کرتا ہے کہ آپ کے کمائے ہوئے پیسے یا اشیا کیسے یا کہاں استعمال کی جائیں؟	1--- You only آپ خود 2--- Your husband only آپکے خاوند 3--- You & your husband jointly آپ اور آپ کے خاوند 4--- You & other members of the household آپ اور آپکے خاندان کا کوئی اور فرد 5--- Other members of the family (head of the household, elder members of the household) آپ کے خاندان کا کوئی اور فرد (گھر کا سربراہ، گھر کے بڑے)	S_SC_Autonomy_moneyearntspent SSC_autnmy2
3. Who decides how your husband's earnings will be spent? یہ فیصلہ کون کرتا ہے کہ آپ کے خاوند کی کمائی کیسے یا کہاں استعمال کی جائے؟	1--- You only آپ خود 2--- Your husband only آپکے خاوند 3--- You & your husband jointly آپ اور آپ کے خاوند 4--- You & other members of the household آپ اور آپکے خاندان کا کوئی اور فرد 5--- Other members of the family (head of the household, elder members of the household) آپ کے خاندان کا کوئی اور فرد (گھر کا سربراہ، گھر کے بڑے)	S_SC_Autonomy_husbandsearningspent SSC_autnmy3
4. Most of the time, who makes decisions about health care for yourself? آپ کی صحت کی دیکھ بھال سے متعلق فیصلے گھر میں زیادہ تر کون کرتا ہے؟	1--- You only آپ خود 2--- Your husband only آپکے خاوند 3--- You & your husband jointly آپ اور آپ کے خاوند 4--- You & other members of the household آپ اور آپکے خاندان کا کوئی اور فرد 5--- Other members of the family (head of the	S_SC_Autonomy_healthcareforself SSC_autnmy4

	household, elder members of the household) آپ کے خاندان کا کوئی اورفرد (گھر کا سربراہ' گھر کے بڑے)	
5. Most of the time, who makes decisions about making major household purchases (e.g. fan, TV, bicycle, water pump, etc.)? گھر کی بڑی خریداری (مثلاً ٹی وی' پنکھا' سائیکل وغیرہ) سے متعلق فیصلے زیادہ تر کون کرتا ہے؟	1--- You only آپ خود 2--- Your husband only آپکے خاوند 3--- You & your husband jointly آپ اور آپ کے خاوند 4--- You & other members of the household آپ اور آپکے خاندان کا کوئی اور فرد 5--- Other members of the family (head of the household, elder members of the household) آپ کے خاندان کا کوئی اورفرد (گھر کا سربراہ' گھر کے بڑے)	S_SC_Autonomy_purchase householditems_major SSC_autnmy5
6. Most of the time, who makes decisions about making purchases for daily household needs (grocery items such as eggs, bread, washing powder, soap)? گھر کی روزمرہ کی خریداری (مثلاً گھر کا سودا سلف' راشن وغیرہ) سے متعلق فیصلے زیادہ تر کون کرتا ہے؟	1--- You only آپ خود 2--- Your husband only آپکے خاوند 3--- You & your husband jointly آپ اور آپ کے خاوند 4--- You & other members of the household آپ اور آپکے خاندان کا کوئی اور فرد 5--- Other members of the family (head of the household, elder members of the household) آپ کے خاندان کا کوئی اورفرد (گھر کا سربراہ' گھر کے بڑے)	S_SC_Autonomy_ purchasehouseholditems_ minor SSC_autnmy6
7. Most of the time, who makes decisions about visits to your family and relatives *(e.g. parents, brothers, sisters, chacha-chachi, mama-mami, etc*)? آپ کے رشتے داروں (مثلاماں باپ' بہن بھائی' چاچا چاچی' ماما مامی وغیرہ) کے گھر جانے سے متعلق فیصلے زیادہ تر کون کرتا ہے؟	1--- You only آپ خود 2--- Your husband only آپکے خاوند 3--- You & your husband jointly آپ اور آپ کے خاوند 4--- You & other members of the household آپ اور آپکے خاندان کا کوئی اور فرد 5--- Other members of the family (head of the	S_SC_Autonomy_decisions aboutvisits SSC_autnmy7

	household, elder members of the household) آپ کے خاندان کا کوئی اور فرد (گھر کا سربراہ، گھر کے بڑے)	
8. Most of the time, are you allowed to go to the market? عام طور پر آپ کو بازار جانے کی اجازت ہے؟	0---No نہیں 1---Yes ہاں	S_SC_Autonomy_allowedtogotomarket SC_autnmy8
8a. Are you allowed to go alone? کیا آپ کو اکیلے بازار جانے کی اجازت ہے؟	0--- No, with someone else only نہیں، صرف کسی اور کے ساتھ جانے کی اجازت ہے 1--- Yes ہاں	S_SC_Autonomy_allowedtogoalone SSC_autnmy8a
9. Most of the time, are you allowed to go places outside this village? عام طور پر آپکو اس گاوں سے باہر جانے کی اجازت ہے؟	0---No نہیں 1---Yes ہاں	S_SC_Autonomy_placesoutsidevillage SSC_autnmy9
9a. Are you allowed to go alone? کیا آپ کو اکیلے گاوں سے باہر جانے کی اجازت ہے؟	0--- No, with someone else only نہیں، صرف کسی اور کے ساتھ جانے کی اجازت ہے 1--- Yes ہاں	S_SC_Autonomy_allowedtogoalone SSC_autnmy9a
10. Do you have time to do things for yourself? کیا آپ کو اپنے کام کرنے کا وقت ملتا ہے؟	0---No نہیں 1---Yes ہاں 2--- Sometimes کبھی کبھار	S_SC_Autonomy_ SSC_autnmy10

SECTION H : MATERNAL SOCIAL SUPPORT INDEX

Now I'm going to ask you some questions about family and friends, as well as who helps out at home.

اب میں آپ سے آپ کے خاندان، سہیلیوں اور جو لوگ گھر میں آپکی مدد کرتے ہیں ان کے بارے میں کچھ سوال پوچھوں گی.

1. Who fixes meals? Do… کھانا کون بناتا ہے؟	1---You Generally Do It عموماً آپ کرتی ہیں 2---Generally Someone Else Do It, or عموماً کوئی اور کرتا ہے 3---You and Someone Else Do It آپ اور کوئی اور مل کر کرتا ہے 4---No One کوئی نہیں	SC_MSSI_meals SC_MSSI1

2. Who does the grocery shopping? Do … گھر کا سودا سلف کون لاتا ہے؟	1---You Generally Do It عموماً آپ کرتی ہیں 2---Generally Someone Else Do It, or عموماً کوئی اور کرتا ہے 3---You and Someone Else Do It آپ اور کوئی اور مل کر کرتا ہے 4---No One کوئی نہیں	SC_MSSI_grocery SC_MSSI2
3. Who lets your children know what is right or wrong? Do … آپکے بچوں کو صحیح کیا اور غلط کیا ہے، کون بتاتا ہے؟	1---You Generally Do It عموماً آپ کرتی ہیں 2---Generally Someone Else Do It, or عموماً کوئی اور کرتا ہے 3---You and Someone Else Do It آپ اور کوئی اور مل کر کرتا ہے 4---No One کوئی نہیں	SC_MSSI_settingmorals SC_MSSI3
4. Who fixes things around the house or apartment? گھر کی چیزیں کون ٹھیک کرتا ہے؟	1---You Generally Do It عموماً آپ کرتی ہیں 2---Generally Someone Else Do It, or عموماً کوئی اور کرتا ہے 3---You and Someone Else Do It آپ اور کوئی اور مل کر کرتا ہے 4---No One کوئی نہیں	SC_MSSI_fixingthings SC_MSSI4
5. Who does the cleaning? گھر کی صفائی کون کرتا ہے؟	1---You Generally Do It عموماً آپ کرتی ہیں 2---Generally Someone Else Do It, or عموماً کوئی اور کرتا ہے 3---You and Someone Else Do It آپ اور کوئی اور مل کر کرتا ہے 4---No One کوئی نہیں	SC_MSSI_cleaning SC_MSSI5
6. Who pays the bills? بل کون جمع کرواتا ہے؟	1---You Generally Do It عموماً آپ کرتی ہیں	SC_MSSI_billpayment

	2---Generally Someone Else Do It, or عموماً کوئی اور کرتا ہے 3---You and Someone Else Do It آپ اور کوئی اور مل کر کرتا ہے 4---No One کوئی نہیں 5--- N/A لاگو نہیں ہوتا۔	SC_MSSI6
7. Who takes your children to the doctor if he/she is sick? اگر آپ کا بچہ / بچی بیمار ہو تو ڈاکٹر کے پاس کون لے کر جاتا ہے؟	1---You Generally Do It عموماً آپ کرتی ہیں 2---Generally Someone Else Do It, or عموماً کوئی اور کرتا ہے 3---You and Someone Else Do It آپ اور کوئی اور مل کر کرتا ہے 4---No One کوئی نہیں۔	SC_MSSI_childrendoctor SC_MSSI7
8. Who sees to it that your children go to bed? بچوں کو کون سُلاتا ہے؟	1---You Generally Do It عموماً آپ کرتی ہیں 2---Generally Someone Else Do It, or عموماً کوئی اور کرتا ہے 3---You and Someone Else Do It آپ اور کوئی اور مل کر کرتا ہے 4---No One کوئی نہیں	SC_MSSI_childrengotobed SC_MSSI8
9. In general, would you like to see your relatives…? آپ اپنے رشتے داروں سے ملنا چاہتی ہیں؟	1---More often اور زیادہ ملنا چاہتی ہوں 2---Less often تھوڑا کم ملنا چاہتی ہوں 3---Is it about right? مناسب ہے 4---Not At All بالکل بھی نہیں	SC_MSSI_relativesmeeting SC_MSSI9

SECTION I: MULTIDIMENSIONAL SCALE OF PERCIEVED SOCIAL SUPPORT (MSPSS)

We are interested in how you feel about the following statements. Listen each statement carefully. Answer/tell how you feel about each statement.

اب میں آپ سے کچھ سوالات پوچھوں گی۔ جن کے بارے میں ہم یہ جاننا چاہتے ہیں کہ آپ کیسا محسوس کرتی ہیں۔ آپ اس کے مطابق ہمیں جواب دیں۔ ہر سوال کو غور سے سن کر اپنے احساسات کے مطابق جواب دیں۔

1. There is a special person who is around when you are inneed. ضرورت کے وقت کوئی ایسا بھروسے والا شخص ہے جو آپ کو سہارا دے سکتا ہے۔	1—Strongly Disagree 2---Disagree 3---Neither Agree Nor Disagree 4--- Agree 5--- Strongly Agree	S_SC_MSPSS_specialperson SSC_MSPSS1
2. There is a special person with whom you can share your joys and sorrows. کوئی ایسا شخص ہے جس کے ساتھ آپ اپنا دکھ سکھ کر سکتی ہیں۔	1—Strongly Disagree 2--- Disagree 3---Neither Agree Nor Disagree 4--- Agree 5--- Strongly Agree	S_SC_MSPSS_specialperson_sharejoys SSC_MSPSS2
3. You have a special person who is a real source of comfort to you. کوئی ایسا شخص ہے جس سے بات کر کے آپ کو تسلی ہو جاتی ہے۔	1—Strongly Disagree 2--- Disagree 3---Neither Agree Nor Disagree 4--- Agree 5--- Strongly Agree	S_SC_MSPSS_specialperson_comfort SSC_MSPSS3
4. There is a special person in your life that cares about your feelings. آپ کی زندگی میں کوئی ایسا خاص شخص ہے جو آپ کے احساسات کی قدر کرتا ہو؟	1—Strongly Disagree 2--- Disagree 3---Neither Agree Nor Disagree 4--- Agree 5--- Strongly Agree	S_SC_MSPSS_caresaboutfeelings SSC_MSPSS4
5. Your family really tries to help you. آپ کے گھر والے آپ کی مدد کرنے کی پوری کوشش کرتے ہیں۔	1—Strongly Disagree 2--- Disagree 3---Neither Agree Nor Disagree 4--- Agree 5--- Strongly Agree	S_SC_MSPSS_familyhelpful SSC_MSPSS5
6. You get the emotional help and support you need from your family. آپ کے گھر والے آپ کو سہارا دینے کے لئے موجود ہوتے ہیں۔	1—Strongly Disagree 2--- Disagree 3---Neither Agree Nor Disagree 4--- Agree 5--- Strongly Agree	S_SC_MSPSS_emotionalsupport_family SSC_MSPSS6
7. You can talk about your problems with your family. آپ اپنے گھر والوں سے اپنی مشکلوں اور مسائل کے بارے میں بات کر سکتی ہیں۔	1—Strongly Disagree 2--- Disagree 3---Neither Agree Nor Disagree 4--- Agree	S_SC_MSPSS_talkaboutproblems_family SSC_MSPSS7

	5--- Strongly Agree	
8. Your family is willing to help you make decisions. اگرآپ کو کوئی فیصلہ کرنا ہو توآپ کے گھر والے آپ کو مشورہ دینے کے لئے موجود ہوتے ہیں۔	1—Strongly Disagree 2--- Disagree 3---Neither Agree Nor Disagree 4--- Agree 5--- Strongly Agree	S_SC_MSPSS_family_makedecisions SSC_MSPSS8
9. Your friends really try to help you. آپ کی سہیلیاں آپ کی مدد کرنے کی پوری کوشش کرتی ہیں۔	1—Strongly Disagree 2--- Disagree 3---Neither Agree Nor Disagree 4--- Agree 5--- Strongly Agree	S_SC_MSPSS_friendshelp SSC_MSPSS9
10. You can count on your friends when things go wrong. اگرآپ کو کوئی مشکل ہو توآپ کی سہیلیاں آپ کی مدد کے لئے موجود ہو نگی۔	1—Strongly Disagree 2--- Disagree 3---Neither Agree Nor Disagree 4--- Agree 5--- Strongly Agree	S_SC_MSPSS_countonfriends SSC_MSPSS10
11. You have friends with whom you can share your joys and sorrows. آپ اپنی سہیلیوں کے ساتھ اپنا دکھ سکھ کر سکتی ہیں۔	1—Strongly Disagree 2--- Disagree 3---Neither Agree Nor Disagree 4--- Agree 5--- Strongly Agree	S_SC_MSPSS_sharejoysandsorrows SSC_MSPSS11
12. You can talk about your problems with your friends. اگر کوئی مسئلہ ہو توآپ اپنی سہیلی سے اس بارے میں بات کر سکتی ہیں۔	1—Strongly Disagree 2--- Disagree 3---Neither Agree Nor Disagree 4--- Agree 5--- Strongly Agree	S_SC_MSPSS_talkaboutproblems SSC_MSPSS12

SECTION J: LIFE EVENTS CHECKLIST

We want to know about the events that you or your family have faced in the **LAST YEAR**. Please listen to these questions carefully and answer in accordance to your condition.

اب ہم آپ سے اُن واقعات کے بارے میں پوچھیں گے جن کا آپ نے اور آپ کے خاندان نے پچھلے ایک سال میں سامنا کیا ہے۔

1. You yourself or a close relative of yours had been ill or had an accident which led to hospitalization. کیا آپ خود یا آپ کا کوئی قریبی رشتے دار بیمار ہوا یا کوئی حادثہ پیش آیا جسکی وجہ سے ہسپتال میں داخل ہونا پڑا۔	0---No نہیں 1---Yes ہاں	SC_LEC_accdnt SC_LEC1
2. Any of your close relatives died or committed suicide or had gotten seriously ill. آپکے کسی قریبی رشتے دار کی وفات ہوئی یا خودکشی کی یا شدید بیمار ہوا	0---No نہیں 1---Yes ہاں	SC_LEC_relativedeath SC_LEC2
3. Has anyone in your family had problems of livelihood? For example unemployment, losing a job or starting new work/job. کیا آپکے خاندان میں کسی کو روزگار کے مسائل ہوئے ۔مثلاً بے روزگاری، نوکری کا ختم ہونا یا نئی نوکری کا ملنا	0---No نہیں 1---Yes ہاں	SC_LEC_livelihood SC_LEC3
4. You or someone in your family has had any financial problem (e.g. having debt). آپ یا آپکے خاندان میں کسی کو مالی مسائل کا سامنا کرنا پڑا۔مثلا قرض وغیرہ	0---No نہیں 1---Yes ہاں	SC_LEC_financialpblm SC_LEC4
5. You or someone in your family has had a change in social status. (e.g. – someone's engagement or marriage, separation or divorce, starting or finishing education) آپ یا آپکے خاندان میں کسی کی سماجی حیثیت تبدیل ہوئی (مثلاً کسی کی منگنی یا شادی، علیحدگی یا طلاق، تعلیم کا شروع ہونا یا ختم ہونا)	0---No نہیں 1---Yes ہاں	SC_LEC_changesocialstatus SC_LEC5
6. You yourself have had any problem with your residence. (e.g. change of residence or problems with neighbors) کیا آپ کو رہائش سے متعلق مسائل پیش آئے (مثلاً گھر کا بدلنا یا پڑوسیوں کی طرف سے مسائل)	0---No نہیں 1---Yes ہاں	SC_LEC_residence SC_LEC6
7. Your relations with any of your close relatives or friends have been troubled (e.g. quarrels or falling out etc.) آپ کے قریبی رشتے دار یا دوست سے تعلقات خراب ہوئے (۔مثلا لڑائی جھگڑا، قطع تعلّقی)	0---No نہیں 1---Yes ہاں	SC_LEC_clsrelatvsunrest SC_LEC7

8. Your marital relations with your spouse have had problems. (e.g. Quarrels or rows etc.) آپکے ازدواجی تعلقات خراب ہوئے ہوں (مثلاً لڑائی جھگڑا)	0---No نہیں 1---Yes ہاں	SC_LEC_maritalunrest SC_LEC8
Prompt: check N/A for question no. 9, if first time pregnant		
9. You have been worried about your children's problems (e.g. Problems concerning children's health and education etc.). آپ اپنے بچوں کے مسائل کی وجہ سے پریشان ہوئے (مثلاً بچوں کی صحت اور تعلیم کے متعلق مسائل)	0---No نہیں 1---Yes ہاں **9--- N/A**	SC_LEC_chldproblems SC_LEC9
10. You or other family members have had rows/quarrels amongst themselves. آپ یا آپکے خاندان کے دیگر افراد کے درمیان لڑائی جھگڑا رہا ہو	0---No نہیں 1---Yes ہاں	SC_LEC_quarrel SC_LEC10

SECTION K: Intimate Partner Violence (IPV)

Note: The situation/ condition for administering IPV is favourable. SC_IPVcondition
0--- No
1--- Yes

The next questions are about things that happen to many women, and that your husband may have done to you.

اگلے سوالات ایسی باتوں کے متعلق ہیں جو کہ بہت سی خواتین کے ساتھ ہوتی ہیں اور اس سے متعلق جو آپ کے خاوند نے آپکے کے ساتھ کیا ہو۔

Please listen to these questions carefully and answer as best as you can.

برائے مہربانی ان سوالات کو غور سے سنیں اور پھر تسلی سے جواب دیں۔

Because these questions can be sensitive, I will change the topic of conversation if anyone interrupts us. I will only continue with these questions once we have privacy again. I would again like to assure you that your answers will be kept secret, and that you do not have to answer any questions that you do not want to.

Please let me know if at any time you would like to take a break. May I continue?

چونکہ یہ سوالات حساس نوعیت کے ہیں لہٰذا اگر کسی نے اس میں مداخلت کی تو میں اپنی گفتگو کا موضوع تبدیل کر لوں گی۔اور پھر جب دوبادہ اس بات کا یقین ہو جائے گا کہ آپ بلا جھجک سوالوں کے جوابات دے سکتیں ہیں تو صرف اسی صورت میں انٹرویو دوبارہ شروع کروں گی۔ میں دوبارہ آپکو اس بات کی یقین دہانی کرانا چاہتی ہوں کہ آپ کے جوابات کو صیغہ راز میں رکھا جائے گا' اور اگر آپ کسی سوال کا جواب نہ دینا چاہیں تو بے شک نہ دیں۔اگر اس دوران آپ کسی بھی وقت وقفہ لینا چاہتی ہیں تو مجھے بتادیں۔کیا بات چیت شروع کریں؟

IPV Psychological		
Now I'm going to ask you about things your husband may have done to you. Has your husband ever اب میں آپ سے ان باتوں کے متعلق سوال کرنا چاہوں گی۔جو آپ کے خاوند نے آپ کے ساتھ کی ہوں؟ کیا آپ کے خاوند نے کبھی؟		
1.Has your husband ever Insulted you or made you feel bad about yourself? Belittled or humiliated you in front of other people? آپ کی بے عزتی کی ہو یا لوگوں کے سامنے آپ کے ساتھ ایسا رویہ رکھا ہو جو باعثِ ذلت ہو؟	0 – No نہیں 1 – Yes ہاں 9 – No Response کوئی جواب نہیں	SC_IPV_husb_belittle SC_IPV1
1a. Has this happened in the past 12 Months? پچھلے ۱۲ ماہ میں ایسا ہوا؟	0 – No نہیں 1 – Yes ہاں 9 – No Response کوئی جواب نہیں	SC_IPV_husb_belittle_12mths SC_IPV1a
1b. You say that this has happened one or two times, three to five times, or more than 5 times اگر پچھلے ۱۲ ماہ کے دوران ہوا تو کتنی بار ہوا؟	1---1-2 Times دفعہ 2---3-5 Times دفعہ 3---6-10 Times دفعہ 4---11-20 Times دفعہ 5---More Than 20 Times	SC_IPV_husb_intimidate_frequency SC_MHS2b

	20 سے زیادہ بار 9---No Response کوئی جواب نہیں	
2. Threatened to hurt you or someone you care about? آپکو یا آپ سے متعلقہ کسی فرد کو نقصان پہنچانے کی دھمکی دی ہو؟	0 – No نہیں 1 – Yes ہاں 9 – No Response نہیں کوئی جواب	SC_IPV_husb_threaten SC_MHS3
2a. Has this happened in the past 12 Months? پچھلے ۱۲ ماہ میں ایسا ہوا؟	0 – No نہیں 1 – Yes ہاں 9 – No Response نہیں کوئی جواب	SC_IPV_husb_threaten_12mths SC_IPV3a
2b. You say that this has happened one or two times, three to five times, or more than 5 times اگر پچھلے ۱۲ ماہ کے دوران ہوا تو کتنی بار ہوا؟	1---1-2 Times دفعہ 2---3-5 Times دفعہ 3---6-10 Times دفعہ 4---11-20 Times دفعہ 5---More Than 20 Times 20 سے زیادہ بار 9---No Response کوئی جواب نہیں	SC_IPV_husb_threaten_frequency SC_IPV3b

IPV PHYSICAL

I am now going to ask you about some situations that aretrue for many women. Thinking about your husband,would you say it is generally true that he …

اب میں آپ سے کچھ اس نوعیت کے سوالات پوچھنے لگی ہوں جو کہ بہت سی عورتوں سے جڑے ہوئے ہیں۔ سوچیے آپ کے خاوند نے کبھی آپ کو ایسا کہا۔۔۔!

1. Slapped you or thrown something at you that could hurt you? Pushed you or shoved you or pulled your hair? آپ کو تھپڑ، مکا، لات ماری ہو یا زور سے بال کھینچے ہوں یا آپ کو کوئی چیز ماری ہو جس سے آپ کو چوٹ لگی ہو؟	0 – No نہیں 1 – Yes ہاں 9 – No Response کوئی جواب نہیں	SC_IPV_husb_slapped SC_IPV11
1a. Has this happened in the past 12 Months? پچھلے ۱۲ ماہ میں ایسا ہوا؟	0 – No نہیں 1 – Yes ہاں 9 – No Response کوئی جواب نہیں	SC_IPV_husb_slapped_12mths SC_IPV11a
1b. You say that this has happened one or two times, three to five times, or more than 5 times اگر پچھلے ۱۲ ماہ میں ایسا ہوا تو کتنی بار ہوا؟	1---1-2 Times دفعہ 2---3-5 Times دفعہ 3---6-10 Times دفعہ 4---11-20 Times دفعہ 5---More Than 20	SC_IPV_husb_slapped frequency SC_IPV11b

	Times 20 سے زیادہ بار 9---No Response کوئی جواب نہیں	
2. Choked or burnt you on purpose? آپ کا گلا دبایا ہو یا آپ کو جلایا ہو؟	0 – No نہیں 1 – Yes ہاں 9 – No Response کوئی جواب نہیں	SC_IPV_husb_choked_ SC_IPV12
2a. Has this happened in the past 12 Months? پچھلے ۱۲ ماہ میں ایسا ہوا؟	0 – No نہیں 1 – Yes ہاں 9 – No Response کوئی جواب نہیں	SC_IPV_husb_choked_12mths SC_IPV12a
2b. You say that this has happened one or two times, three to five times, or more than 5 times اگر پچھلے ۱۲ ماہ کے دوران ہوا تو کتنی بار ہوا؟	1---1-2 Times دفعہ 2---3-5 Times دفعہ 3---6-10 Times دفعہ 4---11-20 Times دفعہ 5---More Than 20 Times 20 سے زیادہ بار 9---No Response کوئی جواب نہیں	SC_IPV_husb_choked_frequency SC_IPV12b
3. Threatened to use a gun, knife or otherWeapon against you? کوئی ہتھیار مثلاً بندوق چاقو استعمال کرنے کی دھمکی دی ہو؟	0 – No نہیں 1 – Yes ہاں 9 – No Response کوئی جواب نہیں	SC_IPV_husb_threaten_weaponuse SC_IPV13
3a. Has this happened in the past 12 Months? پچھلے ۱۲ ماہ میں ایسا ہوا؟	0 – No نہیں 1 – Yes ہاں 9 – No Response کوئی جواب نہیں	SC_IPV_husb_ threaten_weaponuse _12mths SC_IPV13a
3b. You say that this has happened one or two times, three to five times, or more than 5 times اگر پچھلے ۱۲ ماہ کے دوران ہوا تو کتنی بار ہوا؟	1---1-2 Times دفعہ 2---3-5 Times دفعہ 3---6-10 Times دفعہ 4---11-20 Times دفعہ 5---More Than 20 Times 20 سے زیادہ بار 9---No Response کوئی جواب نہیں	SC_IPV_husb_ threaten_weaponuse Frequency SC_IPV13b
4. Actually used a gun, knife or other	0 – No نہیں	SC_IPV_husb_actual_weaponuse

weapon against you? واقعی ہی کبھی بندوق، چاقو یا کوئی اور ہتھیار آپ پر چلایا ہو؟	1 – Yes ہاں 9 – No Response کوئی جواب نہیں	SC_IPV14
4a. Has this happened in the past 12 Months? پچھلے ۱۲ ماہ میں ایسا ہوا؟	0 – No نہیں 1 – Yes ہاں 9 – No Response کوئی جواب نہیں	SC_IPV_husb_ actual_weaponuse _12mths SC_IPV14a
4b. You say that this has happened one or two times, three to five times, or more than 5 times اگر پچھلے ۱۲ ماہ کے دوران ہوا تو کتنی بار ہوا؟	1---1-2 Times دفعہ 2---3-5 Times دفعہ 3---6-10 Times دفعہ 4---11-20 Times دفعہ 5---More Than 20 Times 20 سے زیادہ بار 9---No Response کوئی جواب نہیں	SC_IPV_husb_ actual_weaponuse _frequency SC_IPV14b

This situation is favourable for administering sexual violence questions
0---no
1----yes

1. Did your husband ever physically force you to have sexual intercourse when you did not want to? کیا کبھی آپ کے خاوند رات کو آپ کی مرضی کے بغیر آپ کے پاس آئے ہیں؟	0 – No نہیں 1 – Yes ہاں 9 – No Response کوئی جواب نہیں	SC_IPV_husb_sexualintercourse_whendidnotwant SC_IPV23
1a. Has this happened in the past 12 Months? پچھلے ۱۲ ماہ میں ایسا ہوا؟	0 – No نہیں 1 – Yes ہاں 9 – No Response کوئی جواب نہیں	SC_IPV_husb_sexualintercourse_whendidnotwant_12mths SC_IPV23a
1b. You say that this has happened one or two times, three to five times, or more than 5 times. اگر پچھلے ۱۲ ماہ کے دوران ہوا تو کتنی بار ہوا؟	1---1-2 Times دفعہ 2---3-5 Times دفعہ 3---6-10 Times دفعہ 4---11-20 Times دفعہ 5---More Than 20 Times 20 سے زیادہ بار 9---No Response کوئی جواب نہیں	SC_IPV_husb_sexualintercourse_whendidnotwant_frequency SC_IPV23b
2. Did you ever have sexual intercourse when you did not want to becauseyou were afraid of what your husband might	0 – No نہیں 1 – Yes ہاں	SC_IPV_husb_sexualintercourse_afraidwhat_hsub_mightdo

do? کیا کبھی آپ نے رات کو اپنے خاوند کو اپنے پاس نہ چاہتے ہوئے بھی آنے دیا صرف اس ڈر کی وجہ سے کہ نا جانے وہ کیا کریں؟	9 – No Response کوئی جواب نہیں	SC_IPV24
2a. Has this happened in the past 12 Months? پچھلے ۱۲ ماہ میں ایسا ہوا؟	0 – No نہیں 1 – Yes ہاں 9 – No Response کوئی جواب نہیں	SC_IPV_husb_sexualintercourse_afraidwhat_hsub_mightdo_12mths SC_IPV24a
2b. You say that this has happened one or two times, three to five times, or more than 5 times. اگر پچھلے ۱۲ ماہ کے دوران ہوا تو کتنی بار ہوا؟	1---1-2 Times دفعہ 2---3-5 Times دفعہ 3---6-10 Times دفعہ 4---11-20 Times دفعہ 5---More Than 20 Times 20 سے زیادہ بار 9---No Response کوئی جواب نہیں	SC_IPV_husb_sexualintercourse_afraidwhat_hsub_mightdo_frequency SC_IPV24b
3. Did your husband ever force you to do something sexual that you found degrading or humiliating? کیا کبھی رات میں آپ کے خاوند نے آپ کو کچھ ایسا کرنے پر مجبور کیا ہو جس پر آپ کو ذلت یا بے عزتی محسوس ہوئی ہو؟	0 – No نہیں 1 – Yes ہاں 9 – No Response کوئی جواب نہیں	SC_IPV_husb_sexualintercourse_thatfound_degrading SC_IPV25
3a. Has this happened in the past 12 Months? پچھلے ۱۲ ماہ میں ایسا ہوا؟	0 – No نہیں 1 – Yes ہاں 9 – No Response کوئی جواب نہیں	SC_IPV_husb_sexualintercourse_thatfound_degrading_12mths SC_IPV25a
3b. You say that this has happened one or two times, three to five times, or more than 5 times. اگر پچھلے ۱۲ ماہ کے دوران ہوا تو کتنی بار ہوا؟	1---1-2 Times دفعہ 2---3-5 Times دفعہ 3---6-10 Times دفعہ 4---11-20 Times دفعہ 5---More Than 20 Times 20 سے زیادہ بار 9---No Response کوئی جواب نہیں	SC_IPV_husb_sexualintercourse_thatfound_degrading_frequency SC_IPV25b

NOTE: Anyone from question # 23, 24, 25 will be **1** then ask question # 26.

4. In the past 12 months, how often were you afraid that your husband might do some of these things we've talked about, like hurting you physically or forcing you sexually? پچھلے 12 مہینے میں آپ کے خاوند نے آپکو مارا پیٹا ہو (آپ کی مرضی کے بغیر آپ کے پاس آئے) اس وجہ سے آپ کتنی ڈری رہی؟	1 Always ہمیشہ 2 Often اکثر 3 Sometimes کبھی کبھار 4 Rarely بہت کم 5 Never کبھی نہیں 9 No Response کوئی جواب نہیں	SC_IPV_husb_sexual violence_howoften_afraid_12mths _frequency SC_IPV26

SECTION L: FOOD FREQUENCY QUESTIONNAIRE

How often do you take the following foods in a day, in a week, in a month?

اب میں آپ سے پچھلے مہینے، ہفتے کے دوران اور پچھلے دن میں آپ نے جو خوراک لی اس کے بارے میں جاننا چاہوں گی۔

S #	Food Items	Responses	Variable Names	comments
1.1	Do you eat Bread? کیا آپ ڈبل روٹی کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_bread	**If No- go to next food item at 2.1**
1.2	Do you eat Bread daily? کیا آپ ڈبل روٹی روزانہ کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_bread_ daily	**If No. to daily intake - go to weekly intake:1.4**
1.3	How many times you eat Bread daily? آپ روزانہ ڈبل روٹی کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 >5	SC_Eat_bread_ daily_frequency	
1.4	Do you eat Bread weekly? آپ ڈبل روٹی ہفتہ وار کھاتی ہیں؟ یا آپ ہر ہفتے میں ڈبل روٹی کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_bread_ weekly	**If No, to weekly intake, go to next item:1.6**
1.5	How many times in a week you eat Bread? آپ ہفتے میں ڈبل روٹی کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 6	SC_Eat_bread_ weekly_frequen cy	
1.6	Do you eat bread monthly? کیا آپ ڈبل روٹی مہینہ وار کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_bread_ monthly	**If No, to monthly intake, go to next item:2.1**
1.7	How many times in a month you eat bread? آپ ڈبل روٹی مہینے میں کتنی مرتبہ کھاتی ہیں؟	1 2 3	SC_Eat_bread_ monthly_freque ncy	
2.1	Do you eat rusk? کیا آپ رسک (پاپے) کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_rusk	**If No, to monthly intake, go to next item:3.1**
2.2	Do you eat rusk daily? کیا آپ پاپے روزانہ کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_rusk_da ily	**If No. to daily intake - go to weekly**

				intake:2.4
2.3	How many times you eat rusk daily? آپ پاپے روزانہ کتنی بار کھاتی ہیں؟	1 2 3 4 5 >5	SC_Eat_rusk_daily_frequency	
2.4	Do you eat rusk weekly? آپ پاپے ہفتہ وار کھاتی ہیں؟ یا آپ پاپے ہر ہفتے کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_rusk_weekly	**If No. to daily intake - go to weekly intake:2.6**
2.5	How many times in a week you eat rusk? آپ ہفتے میں رسک (پاپے) کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 6	SC_Eat_rusk_weekly_frequency	
2.6	Do you eat rusk monthly? کیا آپ رس مہینہ وار کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_eat_rusk_monthly	**If No, to monthly intake , go to next item:3.1**
2.7	How many times in a month you eat rusk? آپ رسک (پاپے) مہینے میں کتنی مرتبہ کھاتی ہیں؟	1 2 3	SC_eat_rusk_monthly_frequency	
3.1	Do you eat Roti/Naan/paratha? کیا آپ روٹی/ نان/پراٹھا کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_roti_naan_paratha	**If No- go to next food item –at 4.1**
3.2	Do you eat Roti/Naan/paratha daily? کیا آپ روٹی/ نان/ پراٹھا روزانہ کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_roti_naan_paratha_daily	**If No. to daily intake - go to weekly intake:3.4**
3.3	How many times you eat Roti/Naan/paratha daily? آپ روزانہ روٹی/ نان/ پراٹھا کتنی مرتبہ کھاتی ہیں	1 2 3 4 5 >5	SC_Eat_roti_naan_paratha_daily_frequency	
3.4	Do you eat Roti/Naan/paratha weekly? آپ روٹی/ نان/ پراٹھا ہفتہ وار کھاتی ہیں؟ یا آپ روٹی/ نان/ پراٹھا ہر ہفتے کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_roti_naan_paratha_weekly	**If No, to weekly intake , go to next item: 3.6**
3.5	How many times in a week you eat Roti/Naan/paratha? آپ ہفتے میں روٹی/ نان/ پراٹھا کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 6	SC_Eat_roti_Naan_paratha_weekly_frequency	
3.6	Do you eat Roti/Naan/paratha monthly? آپ روٹی/ نان/ پراٹھا مہینے میں کتنی مرتبہ کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_roti_Naan_paratha_monthly	**If No, to monthly intake, go to next item: 4.1**
3.7	How many times in a month you eat Roti/Naan/paratha? آپ مہینے میں روٹی/ نان/ پراٹھا کتنی مرتبہ کھاتی ہیں؟	1 2 3	SC_Eat_roti_Naan_paratha_monthly_frequency	
4.1	Do you eat Rice?	0---No نہیں	SC_Eat_rice	**If No- go to**

	کیاآپ چاول کھاتی ہیں؟	1---Yes ہاں		**next food item –at 5.1**
4.2	Do you eat Rice daily? کیاآپ چاول روزانہ کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_rice_daily	**If No. to daily intake - go to weekly intake:4.4**
4.3	How many times you eat Rice daily? آپ روزانہ چاول کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 >5	SC_Eat_rice_daily_frequency	
4.4	Do you eat Rice weekly? آپ چاول ہفتہ وار کھاتی ہیں؟ یا آپ چاول ہر ہفتے کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_rice_weekly	**If No, to weekly intake , go to next item: 4.6**
4.5	How many times in a week you eat Rice? آپ ہفتے میں چاول کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 6	SC_Eat_rice_weekly_frequency	
4.6	Do you eat rice monthly? کیاآپ چاول مہینہ وار کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_rice_monthly	**If No, to monthly intake, go to next item:5.1**
4.7	How many times in a month do you eat rice? آپ چاول مہینے میں کتنی مرتبہ کھاتی ہیں؟	1 2 3	SC_Eat_rice_monthly_frequency	
5.1	Do you eat Maize? کیاآپ مکئی کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_maize	**If No- go to next food item –at 6.1**
5.2	Do you eat Maize daily? کیاآپ مکئی روزانہ کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_maize_daily	**If No. to daily intake - go to weekly intake : 5.4**
5.3	How many times you eat Maize daily? آپ روزانہ مکئی کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 >5	SC_Eat_maize_daily_frequency	
5.4	Do you eat Maize weekly? آپ مکئی ہفتہ وار کھاتی ہیں؟ یا آپ مکئی ہر ہفتے کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_maize_weekly	**If No, to weekly intake, go to next item: 5.6**
5.5	How many times in a week you eat Maize? آپ ہفتے میں مکئی کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 6	SC_Eat_maize_weekly_frequency	

5.6	Do you eat maize monthly? آپ مکئی ہر مہینے کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_maize_monthly	**If No, to monthly intake , go to next item:6.1**
5.7	How many times do you eat maize? آپ مکئی مہینے میں کتنی مرتبہ کھاتی ہیں؟	1 2 3	SC_Eat_maize_monthly_frequency	
6.1	Do you eat Pulses Dal? کیاآپ دال کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_pulses dal	**If No- go to next food item –at 7.1**
6.2	Do you eat Pulses Dal daily? کیاآپ دال روزانہ کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_pulses dal_daily	**If No. to daily intake - go to weekly intake : 6.4**
6.3	How many times you eat Pulses Dal daily? آپ روزانہ دال کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 >5	SC_Eat_pulses dal_daily_frequency	
6.4	Do you eat Pulses Dal weekly? آپ دال ہفتہ وار کھاتی ہیں؟ یا آپ دال ہر ہفتے کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_pulses dal_weekly	**If No, to weekly intake, go to next item: 6.6**
6.5	How many times in a week you eat Pulses Dal? آپ ہفتے میں دال کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 6	SC_Eat_pulses dal_weekly_frequency	
6.6	Do you eat Pulses/Dal monthly? کیاآپ مکئی مہینہ وار کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_pulses dal_monthly	**If No, to monthly intake, go to next item:7.1**
6.7	How many times do you eat Pulses/ Dal in a month? آپ دال مہینے میں کتنی مرتبہ کھاتی ہیں؟	1 2 3	SC_Eat_pulses dal_monthly_frequency	
7.1	Do you eat Vegetables? کیاآپ سبزیاں کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_vegetable	**If No- go to next food item –at 8.1**
7.2	Do you eat Vegetables daily? کیاآپ سبزیاں روزانہ کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_vegetable_daily	**If No. to daily intake - go to weekly intake : 7.4**
7.3	How many times you eat Vegetables daily? آپ روزانہ سبزیاں کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 >5	SC_Eat_vegetable_daily_frequency	

7.4	Do you eat Vegetables weekly? آپ سبزیاں ہفتہ وار کھاتی ہیں؟ یا آپ سبزیاں ہر ہفتے کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_vegetable_weekly	**If No, to weekly intake , go to next item: 7.6**
7.5	How many times in a week you eat Vegetables? آپ ہفتے میں سبزیاں کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 6	SC_Eat_vegetable_weekly_frequency	
7.6	Do you eat vegetables monthly? کیاآپ سبزیاں مہینہ وار کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_vegetable_monthly	**If No, to monthly intake , go to next item:8.1**
7.7	How many times do you eat vegetables in a month? آپ سبزیاں مہینے میں کتنی مرتبہ کھاتی ہیں؟	1 2 3	SC_Eat_vegetable_monthly_frequency	
8.1	Do you eat Fruit? کیاآپ فروٹ کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_fruit	**If No- go to next food item –at 9.1**
8.2	Do you eat Fruit daily? کیاآپ فروٹ روزانہ کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_fruit_daily	**If No. to daily intake - go to weekly intake: 8.4**
8.3	How many times you eat Fruit daily? آپ روزانہ فروٹ کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 >5	SC_Eat_fruit_daily_frequency	
8.4	Do you eat Fruit weekly? آپ فروٹ ہفتہ وار کھاتی ہیں؟ یا آپ فروٹ ہر ہفتے کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_fruit_weekly	**If No, to weekly intake, go to next item: 8.6**
8.5	How many times in a week you eat Fruit? آپ ہفتے میں فروٹ کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 6	SC_Eat_fruit_monthly	
8.6	Do you eat fruit monthly? کیاآپ پھل مہینہ وار کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_fruit_monthly_frequency	**If No, to monthly intake, go to next item:9.1**
8.7	How many times do you eat fruit monthly? آپ فروٹ مہینے میں کتنی مرتبہ کھاتی ہیں؟	1 2 3	SC_Eat_fruit_weekly_frequency	

9.1	Do you eat Meat (beef/mutton)? کیاآپ بڑا/ چھوٹا گوشت کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_meat	**If No- go to next food item –at 10.1**
9.2	Do you eat Meat (beef/mutton) daily? کیاآپ بڑا/ چھوٹا گوشت روزانہ کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_meat_daily	**If No. to daily intake - go to weekly intake :9.4**
9.3	How many times you eat Meat (beef/mutton) daily? آپ روزانہ بڑا/ چھوٹا گوشت کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 >5	SC_Eat_meat_daily_frequency	
9.4	Do you eat Meat (beef/mutton) weekly? آپ بڑا/ چھوٹا گوشت ہفتہ وار کھاتی ہیں؟ یا آپ بڑا/ چھوٹا گوشت ہر ہفتے کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_meat_weekly	**If No, to weekly intake , go to next item:9.6**
9.5	How many times in a week you eat Meat (beef/mutton)? آپ ہفتے میں بڑا / چھوٹا گوشت کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 6	SC_Eat_meat_weekly_frequency	
9.6	Do you eat meat (beef/mutton) monthly? کیاآپ بڑا/ چھوٹا گوشت مہینہ وار کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_meat_monthly	**If No, to monthly intake , go to next item:10.1**
9.7	How many times in a month do you eat meat (beef/mutton)? آپ بڑا/ چھوٹا گوشت مہینے میں کتنی مرتبہ کھاتی ہیں؟	1 2 3	SC_Eat_meat_monthly_frequency	
10.1	Do you eat Chicken? کیاآپ مرغی کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_chicken	**If No- go to next food item –at 11.1**
10.2	Do you eat Chicken daily? کیاآپ مرغی روزانہ کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_chicken_daily	**If No. to daily intake - go to weekly intake:10.4**
10.3	How many times you eat Chicken daily? آپ روزانہ مرغی کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 >5	SC_Eat_chicken_daily_frequency	
10.4	Do you eat Chicken weekly? آپ مرغی ہفتہ وار کھاتی ہیں؟ یا آپ مرغی ہر ہفتے کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_chicken_weekly	**If No, to weekly intake , go to next item:10.6**
10.5	How many times in a week you eat Chicken? آپ ہفتے میں مرغی کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 6	SC_Eat_chicken_weekly_frequency	

10.6	Do you eat chicken monthly? کیاآپ مرغی مہینہ وار کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_chicken_monthly	**If No, to monthly intake, go to next item:11.1**
10.7	How many times do you eat chicken monthly? آپ مرغی مہینے میں کتنی مرتبہ کھاتی ہیں؟	1 2 3	SC_Eat_chicken_monthly_frequency	
11.1	Do you eat Fish? کیاآپ مچھلی کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_fish	**If No- go to next food item –at 12.1**
11.2	Do you eat Fish daily? کیاآپ مچھلی روزانہ کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_fish_daily	**If No. to daily intake - go to weekly intake: 11.4**
11.3	How many times you eat Fish daily? آپ روزانہ مچھلی کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 >5	SC_Eat_fish_daily_frequency	
11.4	Do you eat Fish weekly? آپ مچھلی ہفتہ وار کھاتی ہیں؟ یا آپ مچھلی ہر ہفتے کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_fish_weekly	**If No, to weekly intake, go to next item: 11.6**
11.5	How many times in a week you eat Fish? آپ ہفتے میں مچھلی کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 6	SC_Eat_fish_weekly_frequency	
11.6	Do you eat fish monthly? کیاآپ مچھلی مہینہ وار کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_fish_monthly	**If No, to monthly intake, go to next item:12.1**
11.7	How many times do you eat fish in a month? آپ مچھلی مہینے میں کتنی مرتبہ کھاتی ہیں؟	1 2 3	SC_Eat_fish_monthly_frequency	
12.1	Do you eat Organ Meat? کیاآپ کلیجی/ گردے کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_organmeat	**If No- go to next food item –at 13.1**
12.2	Do you eat Organ Meat daily? کیاآپ کلیجی/ گردے روزانہ کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_organmeat_daily	**If No. to daily intake - go to weekly intake :12.4**
12.3	How many times you eat Organ Meat daily? آپ روزانہ کلیجی/ گردے کتنی مرتبہ کھاتی ہیں	1 2 3 4 5 >5	SC_Eat_organmeat_daily_frequency	
12.4	Do you eat Organ Meat weekly? آپ کلیجی/ گردے ہفتہ وار کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_organmeat_weekly	**If No, to weekly intake , go to next item: 12.6**

	یا آپ کلیجی/ گردے ہر ہفتے کھاتی ہیں؟			
12.5	How many times in a week you eat Organ Meat? آپ ہفتے میں کلیجی/ گردے کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 6	SC_Eat_organmeat_weekly_frequency	
12.6	Do you eat Organ Meat monthly? کیاآپ کلیجی/ گردے مہینہ وار کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_organmeat_monthly	**If No, to monthly intake , go to next item:13.1**
12.7	How many times do you eat Organ Meat monthly? آپ کلیجی/ گردے مہینے میں کتنی مرتبہ کھاتی ہیں؟	1 2 3	SC_Eat_organmeat_monthly_frequency	
13.1	Do you eat Egg? کیاآپ انڈا کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_egg	**If No- go to next food item –at 14.1**
13.2	Do you eat Egg daily? کیاآپ انڈا روزانہ کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_egg_daily	**If No. to daily intake - go to weekly intake :13.4**
13.3	How many times you eat Egg daily? آپ روزانہ انڈا کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 >5	SC_Eat_egg_daily_frequency	
13.4	Do you eat Egg weekly? آپ انڈا ہفتہ وار کھاتی ہیں؟ یا آپ انڈا ہر ہفتے کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_egg_weekly	**If No, to weekly intake , go to next item:13.6**
13.5	How many times in a week you eat Egg? آپ ہفتے میں انڈا کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 6	SC_Eat_egg_weekly_frequency	
13.6	Do you eat egg monthly? کیاآپ انڈہ مہینہ وار کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_egg_monthly	**If No, to monthly intake, go to next item:14.1**
13.7	How many times do you eat egg in a month? آپ انڈا مہینے میں کتنی مرتبہ کھاتی ہیں؟	1 2 3	SC_Eat_egg_monthly_frequency	
14.1	Do you take Milk? کیاآپ دودھ پیتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Take_milk	**If No- go to next food item –at 15.1**
14.2	Do you take Milk daily? کیاآپ دودھ روزانہ پیتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Take_milk_daily	**If No. to daily intake-go to weekly intake:14.4**
14.3	How many times you take Milk daily?	1 2 3 4 5 >5	SC_Take_milk_daily_frequency	

	آپ روزانہ دودھ کتنی بار پیتی ہیں؟			
14.4	Do you take Milk weekly? آپ دودھ ہفتہ وار پیتی ہیں؟ یا آپ ہر ہفتے میں دودھ پیتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Take_milk_ weekly	**If No, to weekly intake , go to next item: 14.6**
14.5	How many times in a week you take Milk? آپ ہفتے میں دودھ کتنی مرتبہ پیتی ہیں؟	1 2 3 4 5 6	SC_Take_milk_ weekly_frequency	
14.6	Do you take Milk monthly? کیاآپ دودھ مہینہ وار پیتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Take_milk_ monthly	**If No, to monthly intake, go to next item:15.1**
14.7	How many times in month do you take milk? آپ دودھ مہینے میں کتنی مرتبہ پیتی ہیں؟	1 2 3	SC_Take_milk_ monthly_frequency	
15.1	Do you eat Cheese/butter? کیاآپ پنیر/ مکھن کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_cheese _butter	**If No- go to next food item –at 16.1**
15.2	Do you eat Cheese/butter daily? کیاآپ پنیر/ مکھن روزانہ کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_cheese _buuter_ daily	**If No. to daily intake - go to weekly intake: 15.4**
15.3	How many times you eat Cheese/butter daily? آپ روزانہ پنیر/ مکھن کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 >5	SC_Eat_cheese _butter_ daily_frequency	
15.4	Do you eat Cheese/ butter weekly? آپ پنیر/ مکھن ہفتہ وار کھاتی ہیں؟ یا آپ پنیر/ مکھن ہر ہفتے کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_cheese _butter_weekly	**If No, to weekly intake , go to next item: 15.6**
15.5	How many times in a week you eat Cheese/butter? آپ ہفتے میں پنیر/ مکھن کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 6	SC_Eat_cheese _butter_weekly _frequency	
15.6	Do you eat Cheese/ Butter monthly? کیاآپ پنیر/ مکھن مہینہ وار کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_cheese _butter_monthl y	**If No, to monthly intake, go to next item:16.1**
15.7	How many times do you eat Cheese/Butter in a month? آپ پنیر/ مکھن مہینے میں کتنی مرتبہ کھاتی ہیں؟	1 2 3	SC_Eat_cheese _butter_monthl y_frequency	
16.1	Do you eat Yogurt? کیاآپ دہی کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_yogurt	**If No- go to next food item –at 17.1**
16.2	Do you eat Yogurt daily?	0---No نہیں	SC_Eat_yogurt_ daily	**If No. to daily intake - go to**

	کیاآپ دہی روزانہ کھاتی ہیں؟	1---Yes ہاں		**weekly intake: 16.4**
16.3	How many times you eat Yogurt daily? آپ روزانہ دہی کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 >5	SC_Eat_yogurt_daily_frequency	
16.4	Do you eat Yogurt weekly? آپ دہی ہفتہ وار کھاتی ہیں؟ یا آپ دہی ہر ہفتے کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_yogurt_weekly	**If No, to weekly intake , go to next item: 16.6**
16.5	How many times in a week you eat Yogurt? آپ ہفتے میں دہی کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 6	SC_Eat_yogurt_weekly_frequency	
16.6	Do you eat Yoghurt monthly? کیاآپ دہی مہینہ وار کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_yogurt_monthly	**If No, to monthly intake, go to next item:17.1**
16.7	How many times in a month you eat yoghurt? آپ دہی مہینے میں کتنی مرتبہ کھاتی ہیں؟	1 2 3	SC_Eat_yogurt_monthly_frequency	
17.1	Do you eat Ghee/Oil? کیاآپ تیل/ گھی کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_ghee_oil	**If No- go to SECTION Q**
17.2	Do you eat Ghee/Oil daily? کیاآپ تیل/ گھی روزانہ کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_ghee_oil_daily	**If No. to daily intake - go to weekly intake :17.4**
17.3	How many times you eat Ghee/ Oil daily? آپ روزانہ تیل/ گھی کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 >5	SC_Eat_ghee_oil_daily_frequency	
17.4	Do you eat Ghee/Oil weekly? آپ تیل/ گھی ہفتہ وار کھاتی ہیں؟ یا آپ تیل/ گھی ہر ہفتے کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_ghee_oil_weekly	**If No, to weekly intake , go to 17.6**
17.5	How many times in a week you eat Ghee/Oil? آپ ہفتے میں تیل/ گھی کتنی مرتبہ کھاتی ہیں؟	1 2 3 4 5 6	SC_Eat_ghee_oil_weekly_frequency	
17.6	Do you eat Ghee/Oil monthly? کیاآپ تیل/ گھی مہینہ وار کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_Eat_ghee_oil_monthly	**If No to monthly intake, go to next section: Q**
17.7	How many times do you eat Ghee/Oil in a month? آپ مہینے میں تیل/ گھی کتنی مرتبہ کھاتی ہیں؟	1 2 3	SC_Eat_ghee_oil_monthly_frequency	

SECTION M: 24 HOUR FOOD RECALL PERIOD

Would you like to tell me what did you eat or drink in last 24 hours? Before Breakfast, at Breakfast, between Breakfast and Lunch, at lunch, between lunch and dinner, at Dinner and after dinner

کل صبح اُٹھنے کے بعد سے کل رات سونے سے پہلے تک کل صبح اُٹھنے کے بعد سے لے کر آج صبح اُٹھنے تک (اس میں جو کچھ آپ نے رات کے دوران کھایا وہ بھی شامل ہے)

In this column record the type of the drink or food taken by respondent	Quantity	
1. Did you eat anything after getting up in morning before breakfast? کیا آپ صبح اٹھنے کے بعد سے لیکر باقاعدہ ناشتے سے پہلے تک کچھ کھاتی ہیں؟	0---No نہیں 1---Yes ہاں	SC_eat_bbf
Bread ڈبل روٹی	How many Bread did you eat? کتنی ڈبل روٹی کھائی؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_bread_quantity_bbf
Rusk (پاپے) رسک	How many rusks did you eat? کتنے رس کھائے؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_rusk_quantity_bbf
Roti/ Naan/ Paratha/ Puri/ Chapaati پراٹھا/ روٹی/نان/چپاتی/پوری	How many Roti / Nan /Paratha Chappati/Puri did you eat? کتنے پراٹھے/روٹی/نان/چپاتی/پوری کھائے؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_roti_naan_paratha_puri_chapaati_quantity_bbf
Rice چاول	How many plates or bowl did you eat? کتنے پیالے یا پلیٹ کھائے؟ 0--- ½ 1--- 1 2--- 2 3--- 3	SC_rice_quantity_bbf

	4--- >3	
Maize مکئی	How many roti /corn did you eat? کتنی روٹی یا چھلی کھائی؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_maize_quantity_bbf
Pulses Dal دال	How many plates/ bowls did you eat? کتنی پلیٹ یا پیالے دال کھائی؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_pulse_quantity_bbf
Vegetables سبزیاں Cooked Vegetables: کدو بیگن بھینڈی	How many plates/ bowls did you eat? کتنے پیالے یا پلیٹ سبزیاں کھائیں؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_vegetables_cooked_quantity_bbf
Vegetables سبزیاں Fresh Vegetables: cucumber, turnip, radish, carrot سلاد کے پتے، ٹماٹر، مولی، تر، کھیرا	How many plates/ bowls did you eat? کتنے پیالے یا پلیٹ سبزیاں کھائیں؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_vegetables_fresh_quantity_bbf
Fruit فروٹ بیر خربوزہ تربوز انگور	How many plate or bowl did you eat? کتنے پیالے یا پلیٹ کھائے؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_fruit_quantity_bbf

Fruit فروٹ سیب کینو کیلا آم اُمرود	How many fruits did you eat? آپ نے کتنے پھل کھائے؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_friut_quantity_bbf
Meat (mutton/beef) بڑاگوشت/چھوٹاگوشت	How many cups did you eat? آپ نے کتنا کھایاہے؟ اندازآپ بوٹیوں سے کپ بھریں توکتنا بھر جائے گا؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_meat_quantity_bbf
Chicken / Fish مرغی/مچھلی	How many cups did you eat? آپ نے کتنا کھایاہے؟ اندازآپ بوٹیوں سے کپ بھریں توکتنا بھر جائے گا؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_chicken_fish_quantity_bbf
Organ Meat (lungs/ kidneys) کلیجی	How many cups did you eat? آپ نے کتنا کھایاہے؟ اندازآپ بوٹیوں سے کپ بھریں توکتنا بھر جائے گا؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_organ meat_quantity_bbf
Egg انڈا	How many eggs did you eat? کتنے انڈے کھائے؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_egg_quantity_bbf

Milk دودھ	How many glass did you take? کتنے گلاس دودھ پیا؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_milk_quantity_bbf
Cheese/ Butter پنیر/ مکھن	How many plate or bowl did you eat? کتنے پیالے یا پلیٹ کھائے؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_cheese_butter_quantity_bbf
Yogurt دہی	How many plate or bowl did you eat? کتنے پیالے یا پلیٹ کھائے؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_yogurt_quantity_bbf
Oil/ Ghee تیل/ گھی	How many Tbsp. did you eat? کتنے چمچ کھائے؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_oil_ghee_quantity_bbf
Others (Please Specify) ان تمام چیزوں کے علاوہ آپ نے کچھ اور بھی کھایا؟	_____	SC_others_quantity_bbf
	How many cups/glass? کتنے کپ/گلاس 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_others_cups_glass_bbf
	How many teaspoons/tablespoons? کتنے چائے/ کھانے کے چمچ کھائے؟ 0--- ½ 1--- 1 2--- 2	SC_others_teaspoon_tablespoon _bbf

	3--- 3 4--- >3	
	How many plates/bowls? کتنے پلیٹ / پیالے کھائے؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_others_plates_bowls_bbf
	How many in numbers? کتنی تعداد میں کھائے؟ 0--- ½ 1--- 1 2--- 2 3--- 3 4--- >3	SC_others_innumbers_bbf

***These questions were repeated at 7 point in times.**

Annex - III

Gmail

junaid rehman <ch.junaidrehman@gmail.com>

Fw: RETH000760 (original approval RETH000716): Research Ethics Approval - Khan Rukhsana (consider this application)

1 message

Dr.Rukhsana Khan <drrukhsanakhan@hotmail.com> Thu, Jul 27, 2017 at 12:59 PM
To: junaid rehman <ch.junaidrehman@gmail.com>

From: Ethics <ethics@liverpool.ac.uk>
Sent: 02 September 2014 7:13 PM
To: Rahman, Atif
Cc: Rukhsana Khan
Subject: RE: RETH000760 (original approval RETH000716): Research Ethics Approval - Khan Rukhsana (consider this application)

Dear Professor Rahman,

I am pleased to inform you that the Sub-Committee has approved the amendment to your study. Details and conditions of the approval can be found below.

Ref: RETH000760 – amendment to RETH000716
Review type: Amendment
Principle Investigator: Professor Atif Rahman
School: Psychological Sciences
Title: Thinking Healthy Programme - Peer Delivered Programme in Pakistan
First Reviewer: Professor Liz Perkins
Date of initial review: 07/08/14
Date of Approval: 02/09/14

The amendment was APPROVED subject to the following conditions:

All serious adverse events must be reported to the Sub-Committee within 24 hours of their occurrence, via the Research Integrity and Governance Officer (ethics@liv.ac.uk).

This approval applies for the duration of the research. If it is proposed to extend the duration of the study as specified in the application form, the Sub-Committee should be notified. If it is proposed to make an amendment to the research, you should notify the Sub-Committee by following the Notice of Amendment procedure outlined at http://www.liv.ac.uk/media/livacuk/researchethics/notice%20of%20amendment.doc. If the named PI / Supervisor leaves the employment of the University during the course of this approval, the approval will lapse. Therefore please contact the Research Integrity and Governance Officer at ethics@liverpool.ac.uk in order to notify them of a change in PI / Supervisor.

Kind regards

Matthew

Human Development Research Foundation

NPO SEAL OF GOOD PRACTICES
HDRF has been certified by the Pakistan Centre for Philanthropy (PCP) on September 11, 2015, for meeting certification standards in the areas of Internal Governance, Financial Management, and Programme Delivery

INSTITUTIONAL REVIEW BOARD-HDRF

Dr. Rukhsana Khan
Institute of Psychology Health and Society
University of Liverpool -UK

August 8th 2014

Dear Dr. Rukhsana Khan,

Submission Title: Prenatal Maternal Depression Symptoms and Dietary Intake – A Population Based Study in Rural Pakistan

HDRF IRB Ref: IRB/002/2017

The research proposal titled "Prenatal Maternal Depression Symptoms and Dietary Intake – A Population Based Study in Rural Pakistan" was evaluated by the "Ethics Review Committee of Human Development Research Foundation (HDRF)" in its ordinary meeting held on 6th August 2014; the proposal was reviewed by the committee in detail.

Confirmation of Ethical Approval

The proposal stands **approved** by the committee and the researcher is allowed to conduct research with the following conditions:

1. Researcher will intimate the committee for any alteration in any component of the proposal.
2. Researcher must notify the committee immediately in the event of any adverse effect on participants or any unforeseen event that might affect the continued ethical acceptability of the project.
3. Researcher will be responsible to conduct the research in accordance with the guidelines established by the institution.

Sincerely,

HDRF Human Development Research Foundation

Shamsa Rizwan
Chair IRB- HDRF
Human Development Research Foundation

Attached to protocol: SHARE-THPP-P, Rawlapindi
Principal Investigator: Atif Rahman
IRB Protocol title: South Asian Hub for Advocacy, Research and Education on mental health (SHARE). Thinking Healthy Program – Peer-delivered (THPP): SHARE-THPP-P
Participation duration: 10 months
Anticipated number of subjects: 560

Introduction of the team

We are affiliated with the Human Development Research Foundation (HDRF), which is a research-based organization located in Mandra and Islamabad. During the last ten years we have been working in different parts of Pakistan to improve mother and child health. In light of our research we advise health departments and policy makers to improve their health related services.

We work in close collaboration with the Lady Health Worker (LHW) Program of Pakistan and other public health institutions like the Health Services Academy in Islamabad, Rawlapindi, Medical College in Rawalpindi, and international institutions/organizations. We carry out rural community-based research programs, related to mother and child health.

The purpose of the Thinking Healthy Program – Peer-delivered study (THPP)

Research has shown that along with the physical health of mothers, their emotional well-being is also a very important component for optimal infant development. Mothers who experience stress and emotional distress may need extra support for themselves and their infants. We are carrying out a research project in Rawalpindi to study the benefits of such a support system called the "**T**hinking **H**ealthy **P**rogram – **P**eer-delivered (THPP)". This program consists of 10 home based individual sessions of around 45 minutes and 4 group based sessions of equal duration; these sessions will start from your pregnancy until 5 months after the birth of your child.

For the duration of this project the THPP sessions will be conducted by a Peer Volunteer (PV) belonging to your local area. PVs will listen to you, provide advice on specific problems you might have, and discuss issues with you regarding your health as well as the health of your baby. PVs might have faced similar issues as you in the past, and possess specific knowledge about motherhood and family life which they will share with you.

Home based THPP sessions will be given only by the PV, while group based sessions will be given jointly by the PV and your local LHW at the LHW's house. All PVs will be trained by HDRF.

How will I be chosen?

You have already been seen by one of our research team members. Our research team member asked you questions about your feelings and emotions to find out if you meet the criteria for stress-related illness. Your answers to these questions indicate that you might be stressed. If you agree to participate, our research team member will ask some further questions about you and your husband's age, education, and current household environment. Responding to these questions will take approximately 20 minutes of your time.

Do I have to take part in this study?
No. Participation is completely voluntary. It is your choice to participate in this study or not. If you choose to participate, you retain the right to refuse answers to any questions that you do not feel comfortable with. Also, you retain the right to withdraw from this study at any point in time without mentioning any reason. Refusal to participate will have no detrimental effect on the health care services you or your family members are receiving from your Basic Health Unit (BHU) or from your LHW.

What will happen to me if I take part?
Women who meet the criteria for stress-related illness will be divided into two groups. One group of women will receive routine/usual care by their existing LHWs in addition to services from the BHU. The other group of women will receive visits from the PV who is trained in THPP, in addition, these group of women will also receive routine/usual care from their LHWs and services from the BHU.

Women in the THPP group will receive advice from the PVs on their emotional health and motherhood. These PVs will be selected and trained so that they are able to help you with specific problems you might have, discuss issues with you regarding your well-being as well as the health of your baby. You will be asked to sit and talk with your PV for around 45 minutes in 10 individual sessions and 4 group based sessions, starting from third trimester of pregnancy until 5 months after child birth. We believe that your PV might be able to help you; your PV comes from a similar background as you and might have faced similar issues as you in the past. It is your choice whether the PV sees you at your own home, the PV's home or at any other place of convenience to you.

Mothers who are not in the THPP group will receive usual routine care by their LHWs as well as routine care from their respective BHUs. We will also inform your LHW about your emotional well-being and levels of stress, so that she may help you to seek care from your BHU.

Can I choose in which group I want to be in?

No. Unfortunately, you cannot choose in which group you would like to be in. This selection is based on equal chance of you being in either of the two groups and this selection is done by a computer program (this process is similar to tossing a coin and then deciding in which group you will get to be in).

How often will I be interviewed?

In addition to the questions about feelings and emotions as well as your family life, you will be interviewed twice by our research team during the duration of the study. This will happen at 3 and 6 months after the birth of your baby. The research team can conduct the interview at your home, or at any other location which is of convenience to you. The research team consists of female researchers only who will ask similar questions as before, i.e. you will be asked questions about your emotions, well-being and difficulties you are experiencing concerning your health. In addition, we would also weigh your baby and ask you questions about your breastfeeding practices. These interviews will help us to determine if the THPP benefits you and your baby's health, and we will be able to compare the results with the other group of women who did not receive THPP.

If you are found to be very stressed or sad and are in need of medical attention at 3 and 6 months after the birth of your child, you will be provided with a referral letter to the IoP and provided assistance in transportation to these health services.

The study will end 6 months after your baby is born.

What are the possible benefits of taking part?
We believe that the program might have a beneficial effect on you and your baby's health. If beneficial effects can be proven at the end of the study, additional PVs in your area will be trained to deliver THPP so that a greater number of mothers who suffer from emotional stress can receive help. If you are interested, we are happy to share our overall findings with you once we completed our study.

What are the possible disadvantages?
Talking about your feelings or sensitive topics may be difficult for some people, and cause emotional distress. You may choose not to answer any of the questions which make you feel uncomfortable or even stop the interview altogether. If you become upset, you will be able to speak with an appropriate member of the research team. Our research team is trained in dealing with these situations and emotional disturbances, and will help you to cope with such feelings.

Confidentiality
All information collected from you and about your baby will be kept strictly confidential. Please note, that we and any researchers working on this study ensure privacy and confidentiality for all study-related data, documents, and findings. The results of all assessments will never be linked to you. The information gathered from you will only be identifiable by a specifically assigned study ID (i.e. a number) and not by using your or your baby's name or using any other personal identifiers. Data will be stored in a password-protected computer at HDRF, and the study results will be reported in a way that ensures complete confidentiality**.** In case you need additional support during the course of the study which we may not be able to provide (e.g. medical help, incidence of violence, needing help from other services in the community, or additional help from your family), we may either inform your LHW, physician, family and/or our ethical review board of HDRF so that appropriate and timely support can be provided to you. Furthermore, any significant new findings impacting your willingness to participate in the study will be conveyed to you

The following individuals and/or agencies will be able to view the information you provide but without disclosure of your name and/or identity:

- The investigator, research team members and other health professionals involved in the study;
- Authorities from the Institutional Review Board ('IRB');
- Members of the Data and Safety Monitoring Board (DSMB) who are monitoring the intervention study of safety.

To maximize the scientific knowledge to be gained from your participation in the project, at the completion of the study your de-identified data (data identified by a code or number) will be made available to qualified researchers external to this project for additional analysis. The data made available will include the de-identified data of you and your baby which was

collected in the study. Data access will be limited to qualified researchers at domestic and international institutions with appropriate protections for human subjects in place.

Will I receive a compensation for this study?
No compensation will be offered for participating in this study. However, in lieu of your time, a token of appreciation will be given to you at the end of the interviews consisting of a few household items.

What should I do in case of emergency?
In case of emergency, please contact Mr Ikhlaq Ahmad (Ph#+92512656172, email:Ikhlaq.malik@hdrfoundation.org) or Dr Omer Bangash (Ph##+92512656172, omer.bangash@hrdfoundation.org) based at HDRF (Address: H#6, St# 55, F-7/4, Islamabad).

Who has approved the study?
This study has been reviewed and approved by a scientific committee at HDRF.

Who should I contact for further information?
If you would like to receive more information regarding our study, or if you would like to discuss your rights regarding participation in this study please contact Mr Ikhlaq Ahmad (Ph# +92512656172, email:Ikhlaq.malik@hdrfoundation.org) or Dr Omer Bangash (Ph # +92512656172, omer.bangash@hrdfoundation.org) based at HDRF (Address: H#6, St# 55, F-7/4, Islamabad).

We believe that this is a very important research project as it will provide vital information to improve maternal health care in Pakistan. We hope that you and your baby will participate in this important study and help us in researching the health needs of pregnant women and mothers in your community, and in designing appropriate programs, by signing this form below.

Thank you for your cooperation.

.....

I have read the request for participation in the ***Thinking Healthy Program - Peer delivered (THPP)***. I have been explained the nature of the research and what I or my baby would be required to do as participants, and I have been given my own copy of the information sheet and consent form, which I have read (or has been read out loud to me). I have had the opportunity to ask questions about the study and any questions that I have asked have been answered to my satisfaction. I consent voluntarily for me and my baby to participate in this study.

☐ I agree to participate in the study.

☐ I do not agree to participate in the study.

Signature of Mother: Signature of impartial witness (if mother illiterate):

_____ _____

Name of mother (please print name):

_____

Date (Day/month/year)

_____

.....

Statement by the researcher/person taking consent

I have accurately read out the information to the potential participant, and to the best of my ability have made sure that the participant understands the purpose and process of the study. I confirm that the mother was given the opportunity to ask questions, and that all of the questions asked by the mother have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and that the consent has been given freely and voluntarily.

☐ IC has been audio-recorded since mother is illiterate and impartial witness is unavailable

A copy of this ICF has been provided to the participant.

Print name of researcher/person taking the consent: _____

Print position of researcher/person taking the consent: _____

Signature of researcher/person taking the consent: Date (Day/month/year):

_____ _____

Attached to protocol: SHARE-THPP-P, Rawalpindi
Principal Investigator: Atif Rahman
IRB Protocol title: South Asian Hub for Advocacy, Research and Education on mental health (SHARE). Thinking Healthy Program – Peer-delivered (THPP): SHARE-THPP-P
Participation duration: 5 minutes
Anticipated number of subjects: 560

The purpose of the Thinking Healthy Program – Peer-delivered study (THPP)

We are affiliated with the Human Development Research Foundation (HDRF), which is a research-based organization located in Mandra and Islamabad. During the last ten years we have been working in different parts of Pakistan to improve mother and child health. In light of our research we advise health departments and policy makers to improve their health related services.

We work in close collaboration with the Lady Health Worker (LHW) Program of Pakistan and other public health institutions like the Health Services Academy in Islamabad, Rawlapindi, Medical College in Rawalpindi, and international institutions/organizations. We carry out rural community-based research programs, related to mother and child health.

Research has shown that mothers who experience stress and emotional distress may need extra support for themselves and their infants. We are carrying out a research project in Kallar Syedan to study the benefits of such a support system called the "**T**hinking **H**ealthy **P**rogram – **P**eer-delivered (THPP)". In order to do so, we first need to identify women who have recently experienced stress.

What do I need to do?

After leaving this information sheet with you for at least one day, we will come back to you to ask you whether you would be interested in responding to our questions on stress-related illness. Once you decide to participate, a research team member of us will approach you and ask you some questions on your feelings and emotions in order to find out if you meet the criteria for stress-related illness. This will take approximately 5 minutes of your time. If your responses indicate that you might be stressed, we will provide you with more information about our study and invite you to take part in it.

Do I have to take part?

No. Participation is completely voluntary. Saying 'no' will have no negative effect on the health care you receive by the lady health workers (LHWs) or health care provided at the Basic Health Unit (BHUs).

What happens next?

If your responses indicate that you might be stressed, we will provide you with more information about our study and THPP and invite you to take part in it.

Confidentiality

All information collected about you will be kept strictly confidential. Please note, that we and any researchers working on this study ensure privacy and confidentiality for all study-related data, documents, and findings. The results of all assessments will never be linked to yourself. In case you need additional support which we may not be able to provide (e.g. medical help, help from other services in the community, or additional help from your family) we may inform your LHW, physician, or family so that you can receive the best treatment and care which is appropriate for your situation.

To maximize the scientific knowledge to be gained from your participation in the project, at the completion of the study your de-identified data (data identified by a code or number) will be made available to qualified researchers external to this project for additional analysis. The data made available will include the de-identified data of you and your baby which was collected in the study. Data access will be limited to qualified researchers at institutions with appropriate protections for human subjects in place.

Who has approved the study?
This study has been reviewed and approved by a scientific committee at HDRF.

Who should I contact for further information?
If you would like to receive more information regarding our study, or if you would like to discuss your rights regarding participation in this study please contact Mr Ikhlaq Ahmad (Ph# +92512656172, email:Ikhlaq.malik@hdrfoundation.org) or Dr Omer Bangash (Ph # +92512656172, omer.bangash@hrdfoundation.org) based at HDRF (Address: H#6, St# 55, F-7/4, Islamabad).

We believe that this is a very important research project as it will provide vital information to improve maternal health care in Pakistan. We hope that you and your baby will participate in this important study and help us in researching the maternal health needs of mothers in your community, and in designing appropriate programs, by signing this form below.

Thank you for your cooperation.

.....

I have read the request for participation in the ***Thinking Healthy Program - Peer delivered (THPP)***. I have been explained the nature of the research and what I would be required to do as participant, and I have been given my own copy of the information sheet and consent form, which I have read (or has been read out loud to me). I have had the opportunity to ask questions about the study and any questions that I have asked have been answered to my satisfaction. I consent voluntarily for me and my baby to participate in this study.

☐ I agree to participate in the study.

☐ I do not agree to participate in the study.

Signature of Mother: Signature of impartial witness (if mother illiterate):

_____ _____

Name of mother (please print name):

_____

Date (Day/month/year)

_____

.....

Statement by the researcher/person taking consent

I have accurately read out the information to the potential participant, and to the best of my ability have made sure that the participant understands the purpose and process of the study. I confirm that the mother was given the opportunity to ask questions, and that all of the questions asked by the mother have been answered correctly and to the best of my ability. I confirm that the individual has not been coerced into giving consent, and that the consent has been given freely and voluntarily.

☐ IC has been audio-recorded since mother is illiterate and impartial witness is unavailable

A copy of this ICF has been provided to the participant.

Print name of researcher/person taking the consent: _____

Print position of researcher/person taking the consent: _____

Signature of researcher/person taking the consent: Date (Day/month/year):

_____ _____

SCREENING CONSENT FORM FOR SHARE

خوشحال ماں اور صحت مند سوچ پروگرام کی تحقیق کا مقصد:

ہمارا تعلق ایک تحقیقی ادارے ہیومن ڈویلپمنٹ ریسرچ فاؤنڈیشن (ایچ۔ ڈی۔آر۔ایف) سے ہے جس کا آفس اسلام آباد اور مندرہ میں ہے۔ ہماری ٹیم گزشتہ دس سال سے آپ کے علاقے میں ماں اور بچے کی صحت پر کام کررہی ہے۔ اپنی تحقیق کی روشنی میں ہم حکومتی اداروں کو مشورے دیتے ہیں تاکہ صحت کی سہولیات کو بہتر بنایا جا سکے۔

ہم آپ کے ضلع کے لیڈی ہیلتھ ورکر پروگرام اور صحت سے متعلقہ ادارے مثلاً ہیلتھ سروسز اکیڈمی اسلام آباد، راولپنڈی میڈکل کالج اور بین الاقوامی اداروں کے ساتھ مل کر دیہی علاقوں میں ماں اوربچے کی صحت پر کام کر رہے ہیں۔

تحقیق سے یہ بات ثابت ہوئی ہے کہ جو مائیں اُلجھن یا پریشانی کا شکار ہوتی ہیں ان کو اور ان کے بچے کو مناسب توجہ کی ضرورت ہوتی ہے۔ ہمارا ادارہ تحصیل کلرسیداں میں ایک تحقیقی پروگرام کرنے جا رہا ہے اس پروگرام کو ہم صحت مند سوچ پروگرام - بذریعہ مقامی رضاکار کہتے ہیں۔ جس میں آپ کے علاقے کی مقامی خواتین کو تربیت دی جائے گی اور وہ رضاکارانہ طور پر ایسے گھرانوں کے ساتھ مل کر کام کریں گی جہاں پر خواتین اُلجھن یا پریشانی کا شکار ہیں ۔اس سلسلے کی پہلی کڑی یہ ہے کہ ہم یہ جان سکیں کہ آیا ماں اُلجھن یا پریشانی کا شکار تو نہیں ہے۔

مجھے کیا کرنا ہوگا؟

یہ معلوماتی پرچہ آپ کے پاس چھوڑ دینے کے بعد ہم یہ جاننا چاہیں گے کہ آپ اُلجھن یا پریشانی سے متعلق سوالات کے جوابات دینا چاہیں گی ۔ اگر آپ شمولیت کے لئے رضامند ہوئیں تو ہماری ٹیم کی ایک ممبر آپ کے پاس آئے گی اور آپ سے آپ کے احساسات اور پریشانیوں سے متعلق مزید سوالات پوچھے گی یہ جاننے کے لئے کہ آپ اُلجھنوں یا پریشانیوں کا شکار ہیں یا نہیں۔اس بات چیت کا دورانیہ تقریباً 5 منٹ ہو گا۔اگر آپ اُلجھن یا پریشانی کا شکار ہوئیں تو ہم آپ کو اپنے پروگرام سے متعلق مزید معلومات فراہم کریں گے اور آپ کو اس پروگرام میں حصہ لینے کے لئے دعوت دیں گے۔

کیامیرے لئے شمولیت ضروری ہے؟

نہیں ، تحقیق میں شمولیت مکمل طور پر رضاکارانہ ہو گی۔ اِنکار کی صورت میں آپ یا آپکے گھرانے کو بنیادی مرکزصحت اور لیڈی ہیلتھ ورکر کی طرف سے دی جانے والی صحت کی بنیادی سہولیات کی فراہمی میں کو ئی حر ج نہیں ہوگا۔

اس کے بعد کیا ہوگا؟

اگر آپ کے جوابات سے ہمیں ایسا لگا کہ آپ اُلجھن یا پریشانی کاشکار ہیں تو ہم آ پ کو اپنی تحقیق اور صحت مند سوچ پروگرام بذریعہ مقامی رضاکار سے متعلق مزید معلومات فراہم کریں گے اوراس پروگرام میں حصہ لینے کی دعوت دیں گے۔

رازداری:

تمام معلومات جوکہ آپ کے بارے میں لی جائیں گی ان کو صیغہ رازمیں رکھا جائے گا۔ یاد رکھیں کہ ہم اور ہماری تحقیقاتی ٹیم جو کہ اس صحت مند سوچ پروگرام بذریعہ مقامی رضاکار میں شامل ہے آپ سے لی گئی تمام معلومات اور اس سے حاصل ہونے والے نتائج کی رازداری کا خیال رکھےگی اورکسی بھی طرح سے آپ کی شناخت ظاہر نہیں کی جائے گی۔ اگر ہمیں لگا کہ آپ کو مزید علاج معالجے کی ضرورت ہے اور گھر میں مزید سہارے کی ضرورت ہے تو ہم آپ کے گھر والوں، آپ کے علاقے کی لیڈی ہیلتھ ورکر اور ڈاکٹر کو بھی آگاہ کریں گے تا کہ آپ کو بہترین سے بہترین مناسب اور بروقت علاج کی سہولت مہیا کی جاسکے۔

آپ جو بھی معلومات مہیا کریں گی اس کو صیغہ راز میں رکھا جائے گا۔ اور صرف تحقیق کے مقصد کے لئے استعمال کیا جائے گا۔ اور یہ جان لیجئے کہ ہم اور ہماری تحقیقی ٹیم تحقیق سے جوڑے نتائج کوظاہرنہیں کرے گی۔آپ کے اس تحقیق میں حصہ لینے سے جو معلومات ہمیں حاصل ہوں گی تحقیق کے مکمل ہونے کی صورت میں وہ معلومات آپ کے نام کے بجائے ایک نمبر کے ساتھ محفوظ کر لی جائیں گی۔اور اسکے بعد ماہرین تحقیق اسکا تجزیہ کریں گے۔اور ان معلومات تک رسائی صر ف چند لوگوں کو ہوگی جن میں ماہرین تحقیق شامل ہوں گے ۔اور ان معلومات کو مکمل حفاظت سے رکھا جائے گا اور کسی بھی جگہ آپ اور آپ کے بچے کا نا م ظاہر نہیں کیا جائے گا۔

اس تحقیق کی منظوری کس نے دی:

اس تحقیق کی منظوری ایچ -ڈی -آر- ایف کی سائنسی کمیٹی نے دی ۔

مزید معلومات کے ذرائع:

اگر آپ صحت مند سوچ پروگرام بذریعہ مقامی رضاکار سے متعلق مزید معلومات حاصل کرنا چاہیں یا آپ اس تحقیق میں شمولیت سے متعلق اپنے حقوق کے بارے میں جاننا چاہیں تو رابطے کے لئے:

نام : اخلاق احمد

فون نمبر: 03005549109

ای میل: ikhlaq.malik@hdrfoundation.org

پتہ: مکان نمبر 6 ، گلی نمبر 55 ، ایف سیون فور اسلام آباد۔

House # 6, Street # 55, F-7/4 Islamabad.

نام : انصار علی

فون نمبر: 03468544457

پتہ: گاؤں بُچہ، نزد دیہی مرکز صحت مندرہ ، گجر خان

ہمیں یقین ہے کہ یہ بہت اہم تحقیق ہے کیونکہ یہ پاکستان میں ماں کی صحت کی بہتری کے بارے میں اہم معلومات مہیا کرے گی۔ ہمیں امید ہے کہ آپ اور آپکا بچہ اس تحقیق میں شامل ہوں گے اور فارم پر دستخط کر کے اپنے علاقے میں حاملہ خواتین اور مائوں کی صحت کی ضروریات اور مناسب پروگرام تشکیل دینے میں ہماری مدد کریں گے۔

آپ کے تعاون کاشکریہ۔

حصہ لینے والے کا بیان:

میں نے صحت مند سوچ پروگرام بذریعہ مقامی رضاکار میں حصہ لینے کے بارے میں درخواست پڑھ لی ہے۔اس پروگرام کی نوعیت کے بارے میں مجھے سار ی باتیں بتادی گئی ہیں اور مجھے یہ بھی معلوم ہے کہ مجھے اور میرے بچے کو اس تحقیق میں حصہ لینے کے بعد کیا کرنا ہوگا ۔ مجھے معلوماتی پرچہ اور اجازت نامہ کی ایک نقل دی گئی جس کو میں نے پڑھ لیا ہے (یا پڑھ کر سنا دیا گیا ہے)۔ مجھے سوالات پوچھنے کے لئے موقع دیا گیا اور میں نے جو بھی سوالات پوچھے مجھے تسلی بخش جواب دئیے گئے ۔ میں اپنی مرضی سے رضاکارانہ طور پر اس تحقیق میں شامل ہونے کے لئے راضی ہوں۔

☐ میں تحقیق میں شامل ہو نے کے لئے رضامند ہوں۔

☐ میں تحقیق میں شامل ہو نے کے لئے رضامند نہیں ہوں۔

ماں کے دستخط _____ غیرجانبدار گواہ کے دستخط (اگر ماں اَن پڑھ ہے تو) _____

ماں کا نام _____

تاریخ _____

رضا مندی لینے والے کا بیان:

میں نے تمام معلومات کو اپنی بہترین صلاحیتوں کے مطابق پڑھ کر شمولیت کرنے والے کو اس کا مقصد اور طریقہ کار سمجھا دیا ہے میں تصدیق کرتی ہوں کہ ماں کو سوالات پوچھنے کا موقع دیا گیا ہے اور جوسوالات اس سے پوچھے گئے ہیں اپنی صلاحیت کے مطابق ان کے درست جوابات دئیے گے ہیں جس میں اس بات کو یقینی بنا یاگیا ہے کہ رضا مندی لینے والے پر کوئی دباؤ نہیں تھااور رضا مندی اپنی مر ضی سے رضاکارانہ طور پر دی گئی ہے۔

(اجازت نامہ ٹیپ ریکارڈ کیا گیا ہے کیوں کہ ماں تعلیم یافتہ نہیں تھی اور کوئی اور غیر جانبدار گواہ بھی موجود نہیں تھا)

اجازت نامہ کی ایک کاپی ماں کو دی گئی ہے۔

اجازت لینے والے کا نام:۔ _____

اجازت لینے والے کا عہدہ: _____

اجازت لینے والے کے دستخط: _____

تاریخ: _____

Systematic Review Protocol

Association of pre-natal depression with diet: A systematic review

Background:

Depression is one of the most common mood disorder and disturbing mental health issue affecting the world at present, resulting in relationships disturbance, alters all the activities of routine life including dietary intake (Patel, 2014). The World Health Organization has claimed that depression is the third largest factor in disease burden globally (the disability adjusted lives per year) and by the year 2030 it will become the largest contributor to global burden of disease for both genders and all ages (WHO, 2011). Prevalence rates of depression vary by WHO region, from as low as 9% in African region to as high as 27% in South East Asia, owing to the comparatively increased population of South East Asia. (Organization, 2017).

Women are more susceptible to depression than men and depression has direr consequences when occur during pregnancy (Conlon & Lynch, 2008). Maternal psychological distress is defined as depression, anxiety and stress during pregnancy or postpartum (Trujillo et al., 2018). Maternal depression causes serious effects on the health of both the mothers and the babies (Grigoriadis et al., 2013). Research revealed that the prevalence of postnatal depression ranges from 12% to 16% whereas antenatal depression accounts for as high as 20% (Leung & Kaplan, 2009). Among other factors like socio-economic deprivation, lack of social support, stressful life events & domestic violence, unhealthy and poor quality diet is also reported to be positively associated with increase prevalence of maternal depression (Trujillo et al., 2018).

In past, most of the reviews had conducted on maternal depression, its dynamics and determinants in general (Beck, 1996; Bennett, Einarson, Taddio, Koren, & Einarson, 2004; Fisher et al., 2012; Gavin et al., 2005; Lancaster et al., 2010; Upadhyay et al., 2017) and limited on the association of nutrition with perinatal depression (Baskin, Hill, Jacka, O'Neil, & Skouteris, 2015; Trujillo et al., 2018). There are several theories on causes and risk factors associated with perinatal depression (Lancaster et al., 2010) but limited on prenatal depression and dietary practices.

There is a need to synthesize the evidence showing link between prenatal depression and dietary practices among pregnant women. This review is endeavoring to highlight connection between depression and dietary intake among expectant women that is likely to have significant effects on health of both the mother and the fetus. This will help the experts in understanding the

phenomenon that health of babies and mothers never improve by focusing only on diet practices of pregnant women. Rather depression associated with inadequate dietary intake also need to be treated promptly in order to prevent relapses and to achieve the goal of healthy mothers and babies.

Review Question:

This review is an attempt to throw light, through the available literature, on association of depression in pregnancy with dietary habits of women. The pertinent review question to be addressed is:

What is the association of prenatal depression with dietary practices of women?

Inclusion Criteria:

Types of Participants:

This review will take into account all studies that exhibit the association of dietary intake with depression in pregnant women.

Types of outcome measure:

Adequate dietary intake will be taken as primary measure of outcome of interest. Nutritional value of diet, comparison of dietary patterns among depressed and non-depressed & pregnant and non-pregnant women, frequency of diet, effect of depression on diet will be taken as secondary measure of outcome.

Types of studies:

Present review will be based on all studies published during 2000 to 2017, in English and indexed in the databases given below, exploring the association of pre-natal depression and dietary intake among pregnant women. In case of unavailability and shortage of such studies, review will broaden the search by including those studies which showed association of, perinatal depression and dietary intake. The review may also extend to the studies which evaluate the association between depression and dietary intake among women, in case of absence of studies related to above mentioned criteria.

Search Strategy:

The search strategy will follow the Preferred Reporting Items for Systematic reviews and Meta Analysis PRISMA guidelines and is comprised of three steps.

- In first step, to search out the relevant studies following Medical Subject Headings (MeSH) terms and keywords will be used:

First step,

- **Dietary terms**: diet, nutrition, food, dietary intake, food intake, dietary supplement, micronutrient

And

- **Maternal depression terms**: perinatal depression, antenatal depression, prenatal depression, postnatal depression, postpartum depression, maternal depression, maternal mental health

Second step,

- **Dietary terms:** diet, nutrition, food, dietary intake, food intake, dietary supplement, micronutrient

And

- **Maternity terms**: pregnancy, pregnant, mothers, maternal, antenatal, prenatal, perinatal, postnatal, postpartum

And

- **General Depression terms**: depression, depress, mood disorder, depressive disorder, mental health, depression in pregnancy

- In next step, titles and abstracts of only published English articles from following databases will be selected systematically for review:
    - CINAHL
    - Cochrane Library
    - EMBASE
    - ERIC
    - Google Scholar
    - PsyINFO
    - PubMed

- In third step, scrutiny of available literature based on their titles and abstracts will be conducted by designated faculty members and full version of selected studies will be obtained for data synthesis.

Backward searches using reference and bibliography lists from articles of interest will also be the part of strategy. Any disagreement on selection of studies between reviewers will be sort out by discussion with principal investigator.

Critical Appraisal:

Identified studies that fulfil the inclusion criteria will be classified into groups based on their study design. We will include researches conducted by using any type of epidemiological study designs in order to avoid missing of any meaningful information, which might be possible by keeping the search limited. On contrary, to synthesize strong evidence, studies need to be comparable with each other in terms of measuring outcomes. Therefore, we will adhere to studies showing any association of prenatal depression with dietary intake. Effects of confounders will be minimized by excluding the studies which are related to nutritional biomarkers and comprised of study subjects with co-morbidities (like Diabetes, HIV/AIDS etc.). To be eligible for review, relevance of each study identified by initial search will be evaluated critically and selected for final inclusion in the review by reviewers. Any incongruity will be resolved through discussion.

Quality assessment:

The quality of cross sectional studies will be assessed by using a checklist used previously by (Fisher et al., 2012; Mirza & Jenkins, 2004; Waqas et al., 2018) to assess the quality of the studies to be included in the systematic review.

Data Collection:

A data extraction tool will be developed . Which will be comprised of general and specific information need to be extracted from studies. General information will be about authors, year of publication and study design. Specific information will focus on study setting, sample size, time of assessment (1^{st}, 2^{nd} or 3^{rd} terms of pregnancy), measurement (about depression and nutrition), outcome and limitations of studies.

Data synthesis:

Selected studies will be evaluated and analyzed critically for above mentioned data and final outcome. Extracted information will be abridged in tables and then logical inferences will be constructed. Meta-analysis will not be performed in this review.

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