**Suicidal ideation within and outside the perinatal period: An exploration of interpersonal factors from a maternal cohort in rural Pakistan to improve intervention targeting**

**Abstract:**

*Objective*: Suicide accounts for substantial mortality in low-resourced settings and contributes to nearly 20% of maternal deaths. In Asia, interpersonal conflict is a salient factor that contributes to suicidal thoughts and actions, yet limited research has been done to explore the type and timing of such conflicts and a woman’s accompanying social support. Identifying such risk factors can inform improved efforts to identify who to target for psychosocial interventions.

*Methods*: Using the Bachpan Cohort study of mothers in Pakistan (n=1154), we examined the prevalence and interpersonal influences on SI within the past two weeks in pregnancy and then at 3, 6, and 24 months after birth. Using hierarchical mixed effects models, we explored the separate and combined associations of interpersonal factors (e.g., social support, interpersonal conflict, isolation, and past year intimate partner violence (IPV)) on SI at each timepoint.

*Results*: SI prevalence was highest in pregnancy (12.2%) and dropped to 5% throughout two years postpartum. Interpersonal conflict and physical IPV were independently associated with increased odds of SI in pregnancy, but not postpartum, except at 6 months. Perceived social support remained a robust independent factor associated with reduced SI at all timepoints.

*Conclusion*: In addition to screening and deploying interventions for perinatal women with depression, targeting interventions for those who also experience interpersonal conflict, including intimate partner violence, may significantly reduce suicidal thoughts and related sequelae. Social support is a viable and potentially powerful target to reduce the burden of suicide among women.

**Highlights**

* Suicidal ideation prevalence was higher in pregnancy compared to postpartum
* Perceived social support was independently associated with reduced suicidal ideation
* Interventions addressing suicide must attend to women’s family and social context

**Keywords:** maternal mental health, suicidal ideation, low-income, intimate partner violence, social support

**Introduction:**

Suicide is a leading contributor to global mortality and three-quarters of these deaths occur in low- and- middle-income countries (LMIC) (Iemmi et al., 2016; Knipe et al., 2019; World Health Organization, 2017). Southeast Asia has the highest rate of suicide fatalities in the world (17.7 per 100,000), and, compared to high-income countries, the burden among women is particularly high where the male to female ratio is closer to one (in high-income countries it is 3:5) (Vijayakumar et al., 2020; Vijayakumar & Phillips, 2016). In the perinatal period, women have increased risk for suicidal ideation (SI), and suicide is a leading cause of death in young women in LMIC (Alhusen et al., 2015; Fuhr et al., 2014). In LMIC settings, up to 20% of maternal deaths are due to suicide and in some regions of South Asia, it is a leading cause of death among women of reproductive age (Lindahl et al., 2005; Onah et al., 2017; Orsolini et al., 2016a). Additionally, between 5 and 27% of women in LMIC have thoughts of suicide in their pregnancy (Onah et al., 2017; Orsolini et al., 2016a). Despite disparities in the suicide burden and recent calls to advance the research agenda surrounding suicide, there remains a substantial paucity of evidence supporting effective strategies for early identification and prevention in low-resourced, culturally diverse contexts (Alexandra Fleischmann et al., 2016; Vijayakumar & Phillips, 2016; World Health Organization, 2014).

The perinatal period may trigger the onset or recurrence of depression, with lasting health impacts on both the mother and child (Rao et al., 2021). While maternal mortality has declined, maternal deaths from suicide remained unchanged (Orsolini et al., 2016b). Women have higher risk for suicidal thoughts and are more likely to experience violence in the perinatal period (Halim et al., 2017; Onah et al., 2017). LMIC perinatal women have high rates of suicidal ideation ranging from 5-23% (Huang et al., 2012; Maré et al., 2021; Onah et al., 2017; Orsolini et al., 2016a; Palfreyman, 2021; Palladino et al., 2011). Suicide ideation is a significant predictor of completed suicide. Though the transition to suicidal behavior is complex and dynamic, ideation assessment remains important for health systems to identify and respond to suicide risk (O'Connor et al., 2013). Research in LMIC highlights that socio-contextual factors may be as important as psychiatric risk factors. Poverty, low education, unemployment, strained relationships, domestic violence, isolation, and low social support are linked to suicidal ideation and behavior, independent of psychiatric disorders (Alexandra Fleischmann et al., 2016; Vijayakumar, 2016; Vijayakumar & Phillips, 2016; World Health Organization, 2014). Thus, although depression is a common risk factor, suicide and suicidal ideation must be recognized as not only expressions of mental disorder (Chan, 2013; Vijayakumar, 2016; Vijayakumar & Phillips, 2016). Screening for and identifying additional risk factors, such as interpersonal conflict and psychosocial stress, and leveraging preventative coping strategies, such as social support and emotional regulation, are promising pathways towards prevention in contexts with limited mental health services (A. Fleischmann et al., 2016). Finally, interpersonal relationships, and how individuals situate their roles, worth, and social connections play integral roles in the pathways to suicide, as outlined by the interpersonal theory of suicide and the Integrated Motivational–Volitional Model of Suicidal Behavior, among others (Chu et al., 2017; Wetherall et al., 2018). While connectedness and social support serve as meaningful factors for suicide prevention among youth (McKeown et al., 1998) and elderly (Duberstein et al., 2004), they may also play an integral role for women when transitioning in and out of childcare and parenting responsibilities.

In Pakistan, innovations in mental health training and services have increased capability of treating maternal depression in community settings, but these efforts have limited longitudinal impacts and have not yet addressed more complex and severe mental health problems, such as suicide (Atif et al., 2016; Sikander, Ahmad, Atif, et al., 2019; Sikander et al., 2015). Qualitative research from Pakistan, Nepal, and other neighboring countries have identified specific relationship dynamics with mother-in-laws and intimate partners as particularly important for psychosocial health and offered these as an explanatory model for suicide deaths (Atif et al., 2016; Hagaman et al., 2018; Marecek & Senadheera, 2012; Rahman, 2007). Additionally, religion deeply shapes personal values, family life, and everyday activities, and is important in both mental health (Maselko et al., 2009) and suicide outcomes (Sisask et al., 2010; Vijayakumar & John, 2018). In Pakistan, religious interpretations inform state law and suicide remains illegal; however, the Mental Health Act of 2001 created opportunities for protection for those who attempt suicide, though implementation is unclear (Naveed et al., 2017). This cultural context contributes to stigma and underreporting of suicide. Identification of contextual and interpersonal risk factors can improve targeting of interventions for women to reduce suicide, particularly if direct questioning about suicide is highly stigmatized. Such considerations can assist with developing prevention interventions that attend to the needs and preferences of communities (Shekhani et al., 2018).

During the substantial transition into motherhood and multiparity, women are exposed to increased risk of morbidity while also attaining new identity, social status, and generativity. Thus, risk and preventative factors throughout these periods may shift (Pritchard, 2013; Rittenour & Colaner, 2012). Married women may be at increased risk for suicidal behavior, particularly in resource-strained contexts and in South Asia (Qadir et al., 2011; Shahid et al., 2015; Shekhani et al., 2018). The purpose of this study is to identify interpersonal risk factors at various windows throughout women’s reproductive life course (e.g., prenatal, postpartum, and outside the perinatal period). Ultimately, we aim to identify factors that improve suicide intervention in settings where women face significant adversity.

**Materials and Methods:**

This analysis draws upon data originally collected within the Bachpan Cohort study, a population-representative longitudinal study of pregnant women, in rural Pakistan between 2015 and 2018. The broader goal was to evaluate the impacts of maternal psychological wellbeing and her broader environment on her health and her child’s development. An embedded intervention on a randomized subsample tested the effects of a low-intensity peer-delivered psychosocial intervention (Maselko et al., 2015; Sikander et al., 2015; Turner et al., 2016). All pregnant women in 40 village clusters were screened for depression using the Urdu Patient Health Questionnaire-9 (PHQ-9) (Spitzer et al., 1992). Depressed women (PHQ-9 ≥ 10) were invited to participate in the trial. Twenty clusters were randomly assigned to the intervention. An equal number of non-depressed women (PHQ-9 < 10) were recruited for the cohort study, resulting in a baseline sample of 1,154 women, representative of the local population of pregnant women. Data collection occurred within four weeks of the following timepoints: baseline (last trimester), three, six, 12, and 24 months postpartum and elicited information related to maternal health, the family and home environment, and child development (Sikander, Ahmad, Bates, et al., 2019).

*Measures:*

*Suicide ideation*: Suicide ideation (SI) in the past two weeks was asked within the Urdu-validated Patient Health Questionnaire (PHQ-9) at all timepoints (Gallis et al., 2018). Any positive response to item-9 (several days, more than half the days, or nearly every day) was coded as current suicidal ideation.

*Modifiable interpersonal risk and preventive factors*: The World Health Organization’s Violence Against Women Instrument elicits intimate partner violence (IPV) experienced in the past year (psychological, physical, sexual) and was assessed annually at baseline, 12, and 24 months postpartum. Family conflict that does not reach IPV levels was assessed with any “yes” response to one of two items from an adapted Life Events and Difficulties Schedule (Rahman et al., 2003): “Have your relations with any of your close relatives been troubled?” and “Have your marital relations with your spouse had problems?”. Isolation (yes/no) was constructed from any difficulty endorsed in “joining community/religious activities in the same way anyone else can?” and/or “in maintaining a friendship”. Social support was measured with the multidimensional scale of perceived social support (MSPSS) (Dahlem et al., 1991) psychometrically validated for our perinatal population (Sharif et al., In Press).

*Depression:* Depressive symptom severity was assessed at baseline, three, six, and 24 months postpartum with the Urdu PHQ-9.(Gallis et al., 2018). Clinically validated within the Pakistani perinatal population, this tool was used extensively with high reliability. For this analysis, the suicide ideation item (Item 9) was removed. The Structured Clinical Interview for DSM IV Disorders (SCID) module for current major depressive episode identified clinical levels of depression. The SCID was culturally adapted for assessing depression among pregnant and postpartum women and has been used extensively in South Asia (Gorman et al., 2004).

*Sociodemographic characteristics*: Baseline maternal age, number of living children, years of maternal education, socioeconomic status (SES), assessed with a comprehensive household asset inventory commonly used in LMIC) (Maselko et al., 2018; Rutstein, 2008; Vyas & Kumaranayake, 2006), and if the mother was currently pregnant (at 24 months postpartum) were also elicited.

*Ethics approval*

The project received approval from the Human Development Research Foundation in Pakistan, Duke University, and University of North Carolina-Chapel Hill, USA.

*Statistical Analysis*

All analyses accounted for the sampling design and applied *Bachpan’s* sampling weights (accounting for over-sampling of depressed women at baseline) so that the sample is representative of the local pregnant population (Maselko et al., 2018). We calculated the point prevalence for suicidal ideation at each data collection wave to map the SI burden throughout windows of pregnancy, postpartum, and non-perinatal. We treated the data as cross-sectional timepoints to maximize dynamic shifts of the perinatal period and to consider the episodic nature of SI over time. Using hierarchical mixed-effects logistic regression models to account for clustering, we explored risk and protective factors of SI at varying points across the reproductive period including pregnancy, perinatal (within one-year post-partum (PP)), and outside the perinatal period (2 years). We first explored these factors independently (A models) including the following adjustors: depression symptoms (Urdu PHQ-9 without the SI item), age, SES, years of maternal education, the individual that conducted the interview (assessor), and treatment arm. We then explored the factors simultaneously (B models), including all adjustors in A models. For outcomes at three and six months, we used baseline IPV (e.g. IPV exposure within prior year collected in third trimester of pregnancy) as it was the most recent IPV datapoint. All other timepoints used the IPV assessment collected concurrently, eliciting IPV exposure in the past year. Due to the correlated nature of the individual IPV sub-types, we included all sub-types in these models. Models assessing the exposure of ‘Any IPV’ did not include sub-type variables. Analyses were conducted in Stata 16. We performed sensitivity checks to explore bias for attrition and variables with missing data and reported results in the supplementary appendix.

**Results**

At baseline, the study included 1,154 pregnant women, with slight attrition throughout the following waves (at three months n=885; six months n=929, and 24 months n=903) (see the *Bachpan* Cohort Profile (Sikander, Ahmad, Bates, et al., 2019) for more information). The characteristics of participants, where sampling weights were applied to adjust for oversampling depressed women, are shown in Table 1. Women, on average, were 26.6 years old at the time of their pregnancy and one-third were pregnant with their first child. More than half received a secondary education or higher and 12.6% lived in a nuclear household. More than forty percent of women reported any IPV in the past year (42.4% at baseline and 53.9% at 24 months postpartum). Suicide ideation in the past two weeks was endorsed by 12.2% of women during pregnancy and then reduced to 5.6%, 5.1%, and 5.3% at three, six, and 24 months postpartum (Table 2). At some point between pregnancy and two years postpartum, 18.2% of women reported SI at least once and 5.2% reported SI two or more times. Among women with SI, nearly 17% of women in pregnancy and 30% of women at three months postpartum did not have major depressive disorder via the SCID. At six and 24 months postpartum, approximately 40% did not have major depressive disorder.

[Insert Tables 1 and 2 about here]

In separate models exploring modifiable interpersonal risk factors (Table 3, A models), we found that beyond depression symptoms, several factors had independent associations with odds of endorsing SI throughout, within, and outside the perinatal period. In pregnancy, physical IPV (aOR =2.50, 95% CI: 1.56-3.99), any IPV (aOR=1.91, 95% CI: 1.28-2.86), and interpersonal conflict (aOR =2.81, 95% CI: 1.87-4.22) were associated with increased likelihood of endorsing SI. Greater social support was associated with a decreased odds of SI (aOR =0.72, 95% CI: 0.62-0.84). At three months postpartum, these models demonstrated similar effect sizes to those in pregnancy but had wider confidence intervals. At six months postpartum, any IPV was associated with a nearly three-fold increase in odds of endorsing SI (aOR: 2.92, 95% CI: 1.44-5.90) and isolation was associated with a 2.05 odds increase (95% CI: 1.01-4.16). Perceived social support remained robustly associated with a nearly 32% decrease in odds of endorsing SI (aOR =0.68, 95% CI: 0.54-0.86). Outside the perinatal window (24 months postpartum), any IPV in the past year and interpersonal conflict in the past two weeks were associated with increased odds of SI (aOR= 2.16, 95% CI: 1.02-4.57 and aOR= 1.19, 95% CI: 1.01-3.63 respectively). Social support reported at 24 months was also associated with a decreased likelihood of endorsing SI (aOR= 0.73, 95% CI: 0.60-0.88).

[Insert Table 3 about here]

Finally, all modifiable interpersonal risk factors were examined simultaneously for each timepoint, within, and outside the perinatal window (Table 3, B models). At all timepoints, we found similar associations as the prior analysis, but with some attenuation for interpersonal risk factors while the effect of social support was slightly enhanced. Social support remained an independent and robust protective factor of SI endorsement at each timepoint (pregnancy aOR= 0.80, 95% CI: 0.68-0.94; six months aOR=0.73, 95% CI: 0.57-0.92; and 24 months aOR=0.77, 95% CI: 0.63-0.94) except for in the third-month postpartum wave where the estimates were similar to above, but with a wider confidence interval (aOR=0.75, 95% CI: 0.55-1.02). In pregnancy, the combined model estimated that interpersonal conflict was associated with 2.32 increased odds of endorsing SI (aOR=2.32, 95% CI: 1.50-3.60) and physical IPV with more than twice the odds (aOR=2.1, 95% CI: 1.24-3.56). At six months postpartum, experiencing any IPV was associated with increased odds of SI (aOR 2.42, 95% CI: 1.18-4.99), but the effect of isolation was attenuated at 24 months (aOR=1.63, 95% CI:0.75-3.76). At 24 months all estimates lost precision but remained in the expected direction. We conducted a sensitivity analysis adjusted for predictors of missingness at each follow-up wave as well as additional analyses adjusted for baseline endorsement of suicide ideation (e.g., in pregnancy). Results remained substantively the same (Appendix).

**Discussion**

At some point between the last trimester and two years postpartum, one of every five women reported suicidal ideation in the past two weeks (19.1%). Suicide ideation endorsement was highest in the pregnancy (12.2%) followed by a steady prevalence around five percent at three, six, and 24 months postpartum. We found interpersonal factors such as intimate partner violence, family conflict, isolation, and social support have independent associations with suicidal ideation, beyond the presence of depression symptoms. Moreover, we find the risk and protective nature of these factors are sustained throughout the perinatal period and the postpartum period. Importantly, higher perceived social support at any time inside and outside a mothers’ perinatal period was associated with reduced suicidal ideation.

Previous research among pregnant women in adverse contexts has documented a large range of SI prevalence from 6% to 27.5% (Gausia et al., 2009; Huang et al., 2012; Lindahl et al., 2005; Onah et al., 2017) and the antenatal prevalence of 12% we found in our study is within this range. Among women with other health conditions, such as HIV, SI may be even higher as Rodriguez et al reported 39% of women living with HIV in South Africa expressed SI in pregnancy (2018). Studies examining the prevalence of SI in the postpartum period are limited and variable based on timing following childbirth, but are generally lower compared to pregnancy ranging from 5.6% to 14.3% anywhere from one week to six months postpartum (Lindahl et al., 2005). Given increased rates during pregnancy, and potential indication of decreased social support amidst increased conflict and IPV (Richardson et al., Under Review), pregnancy is an important time for intervention. Rates reduced postpartum, though little research has directly theorized why. Cultural practices may provide additional social, physical and emotional support for postpartum mothers, such as *chilla* (LeMasters et al., 2020). Motherhood may afford women more cultural and social capital and may elicit powerful emerging/renewed vocation, emotions, and commitment to nurturing new life, thus increasing connectedness and belongingness (Barlow & Chapin, 2010; Crivello et al., 2019). Particularly in locations with high maternal and neonatal mortality, intense fear and anxiety surrounding childbirth may resolve upon birth of a healthy child. Some women continue to have suicidal thoughts and others have new onset SI. Social and interpersonal context may shift SI (Van Orden et al., 2010). Therefore, the etiology and presentation of SI is likely dynamic to the social-contextual conditions women find themselves in.

IPV has consistently been associated with SI among women globally (Devries et al., 2011). Specific to low-income settings, in South Africa, Onah et al (2017) found that IPV was associated with a fourfold increase in likelihood of endorsing suicide ideation and behavior in pregnancy. Rodriguez et al (2018) found IPV predicted sustained suicide ideation from prenatal to postnatal assessments. In our cohort, more women endorsed experiencing IPV in pregnancy, however, rates of IPV were high across all timepoints. This highlights the importance of relationships to women’s psychological health and safety. IPV screening and subsequent supportive interventions are essential to preventing suicidal behaviors. Underscored by previous research highlighting its importance to not only mental health but for overall physical health and longevity, interventions must enhance women’s social supportive environment to provide sufficient pathways to sustained well-being.

 Our study found social support was a robust independent factor associated with reduced likelihood of suicidal ideation. The interpersonal theory of suicide points to the importance of ‘belonging’ or connection to one’s social environment; and studies have confirmed the important protective role of social support (Brausch & Decker, 2014; Chu et al., 2017; Van Orden et al., 2010). Among perinatal women in low-income countries, evidence points to perceived social support in the perinatal period in reducing depressive symptoms for women (Afolabi et al., 2017; Singla et al., 2019; Zhong et al., 2018). We also found this in our sample of mothers in rural Pakistan (Hagaman et al., 2021; LeMasters et al., 2020). In the study, the role of social support went beyond protecting against depression. In line with our findings, South African pregnant women with increased perceived social support were less likely to report suicidal ideation and behavior. Outside of the perinatal window, other significant life events may modify the relationship between social support and suicidality. For widows in Nepal, social support was not associated with increased odds of SI in the past year, but the recency of her husband’s death was, suggesting isolation and social implications of widowhood were important dynamic conditions contributing to SI (Garrison-Desany et al., 2020). The large time window, however, limits our understanding of how events overlap and impact suicide ideation. Qualitative work in India and Nepal highlights the powerful salience of interpersonal context on suicidal thoughts and actions. In Nepal, young women in rural areas were at heightened risk, particularly as they moved from their maternal home into the homes of their husbands (Hagaman et al., 2018). In India, youth describe suicidal behavior as a response to volatile family and intimate relationships (Aggarwal et al., 2020). This was documented in other similar settings across South Asia (Vijayakumar, 2016; Vijayakumar & Phillips, 2016) including Sri Lanka (Widger, 2015), Bangladesh (Canetto, 2008, 2015; Edhborg et al., 2015; Gausia et al., 2009), and India (Aggarwal et al., 2020; Das et al., 2007). Among Muslim women, Canetto (2015) theorizes that suicidality is a recurring form of protest against and escape from oppressive state-regulation and family-based abuse (Canetto, 2008, 2015). In Pakistan, qualitative research has highlighted the importance of supportive relationships and reducing workloads among women for improving their psychosocial wellbeing (Atif et al., 2016).

 Much of the suicide risk literature focuses on comorbid mental health conditions, despite the majority of individuals with mental disorders do not go on to suicide (Lindahl et al., 2005). Garman et al found that among perinatal women, depression and suicide overlap, but are independent phenomena (Garman et al., 2019). In South Africa, Onah et al found 67% of pregnant women with suicidal ideation or behaviors had no depression and 65% had no anxiety disorder. In our study, nearly 30% of women with suicide ideation did not have clinical depression at three months postpartum and 40% did not at 24 months postpartum. In line with this, scholars in low-income contexts argue that attending to the interpersonal and larger social-economic environment may be more important (Chan et al., 2009; Khan et al., 2020; Vijayakumar, 2016). In the study by Onal et al, they found that socio-economic status, food insecurity, IPV, and multiparous were associated with suicidal thoughts and behaviors (Onah et al., 2017). A systematic review including LMICs found that low socio-economic status and low levels of educational attainment were as significant as psychiatric risk factors in the etiology of completed suicides (Li et al., 2011). In our study, we also found that interpersonal factors (e.g., IPV and social support) still predicted SI when included in a model together, pointing to the unique contribution of each factor. This aligns with previous work in LMIC contexts that indicate multiple and complex pathways to SI beyond a psychopathology-specific pathway (Phillips, 2010; Vijayakumar, 2016).

This study has several limitations. Suicidal behaviors beyond ideation were not systematically measured and ideation was assessed with a single item on PHQ-9. Though a robust indicator of subsequent suicidal behavior (Rossom et al., 2017; Simon et al., 2013), no studies have assessed this in Pakistan and the threshold for SI is low and may overestimate ideation. Furthermore, measurements of isolation and family conflict are limited and may not fully capture the range of experiences in this context. Additionally, in Pakistan, suicide is illegal and religiously forbidden (as it is in many religions), furthering stigma and likely suppressing disclosure (Naveed et al., 2017; Shekhani et al., 2018). We treated the data as cross-sectional timepoints to capture the dynamic shifts of the perinatal period and to consider the episodic nature of SI over time. Future analyses can consider the dataset longitudinally to explore changes in SI over time. In the postpartum period, the sample size of women expressing SI is relatively low and interpretations should be made with caution. However, despite limitations, this study is one of few that have investigated the prevalence of SI and associated interpersonal factors of SI at multiple points within and outside the perinatal window in women of low resource non-Western settings.

**Conclusion**

Given increased interpersonal vulnerability, perinatal women, regardless of depression status, should be screened for suicide and afforded appropriate psychosocial support. Stepped-care models are increasingly used in low-resourced contexts and effective at addressing more complex cases. Community engagement and awareness programs through community health workers and peers can attend to the socio-cultural contexts where suicidality is taboo. Technology-delivered interventions may hold promise to reduce this barrier, as issues can be highlighted indirectly in a more comfortable environment. We need to develop and evaluate culturally appropriate interventions addressing SI and associated risks keeping in mind important considerations such as religion, disclosure implications, and family context. Finally, sectors beyond health can help reduce our identified risk factors and encourage social support, such as women’s development, legal, and education sectors. Larger longitudinal studies are needed to better understand the progression of suicidal thoughts, planning, and attempts among vulnerable perinatal women. Investigations of ideation trajectories, more severe forms of suicidal behaviors, interpersonal dynamics, and their impacts on perinatal women could provide valuable insights when developing programs to address psychosocial needs of this population.

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