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**A plea for equitable global access to COVID-19 diagnostics, vaccination and therapy: the NeuroCOVID-19 Task Force of the European Academy of Neurology**

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**Abstract**

Coronavirus disease 2019 (COVID-19), a multi-organ disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), continues to challenge health and care systems around the globe. The pandemic has disrupted acute neurology services and routine patient care and has impacted the clinical course in patients with chronic neurologic disease. COVID-19 appears to have exposed inequalities of societies and healthcare systems and had disproportionate impact on already vulnerable communities. The next challenge will be to set up initiatives to stop disparities in all aspects related to COVID-19. From the medical perspective, there is a need to consider inequalities in prevention, treatment and long-term consequences. With this appraisal, the European Academy of Neurology NeuroCOVID-19 Task Force intends to raise awareness of the potential impact of COVID-19 on inequalities in healthcare and calls for action to prevent disparity at individual, national and supranational level. Some of the issues of direct relevance to neurologists are summarized.

**Introduction**

Coronavirus disease 2019 (COVID-19), a multi-organ disease caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), continues to challenge health and care systems around the globe. In only 12 months since the report of the index case in Wuhan, China, the pandemic has resulted in more than 68 million confirmed cases and 1.6 million deaths worldwide (1). From a neurological perspective, the pandemic has not only disrupted acute services but also routine patient care, through limited provision of resources and hospital avoidance behaviour (2). Even in the absence of SARS-CoV-2 infection, people with chronic neurological conditions including dementia, Parkinson´s disease and epilepsy currently have a higher risk of clinical progression and complications (3-8). The disruptions to patient care and consequent mental distress are considered potential trigger factors for this observation (9, 10).

**Inequalities exposed by COVID-19: general aspects**

COVID-19 appears to have exposed inequalities of societies and healthcare systems and had disproportionate impact on already vulnerable communities. There is an increasing body of evidence that the pandemic continues to have the heaviest impact on the lives of people living in difficult socio-economic circumstances. The incidence and mortality of COVID-19 is also disproportionately higher in certain ethnic minority groups, both in the United States and Europe. In London, Asian people had higher odds of death from COVID-19 compared to white people (11). In another study from the United Kingdom, people of colour had a greater than 4-fold increased risk of COVID-19 infection (12). In a study from Barcelona, the incidence of COVID-19 showed an inverse association with mean income (13). Data from the Stockholm region revealed higher COVID-19 mortality in young and socially vulnerable populations (14).

Moreover, there are consistently higher intensive care unit (ICU) admission and fatality rates in male COVID-19 patients (15). Genetics, immunological responses, and hormonal mechanisms may play a role, and socio-cultural factors such as smoking and handwashing rates have been postulated (16, 17).

**Neurological manifestations of COVID-19**

SARS-CoV-2 infection can also affect the nervous system (18). Headache, myalgia, anosmia, ageusia, impaired consciousness and psychomotor agitation were the most frequent neurological findings in COVID-19 patients according to an international survey conducted by the European Academy of Neurology (EAN) (19). COVID-19-associated encephalopathy and cerebrovascular disorders are further neurological manifestations, which are also associated with unfavourable short-term outcomes compared to age- and sex-matched historical non-COVID-19 cohorts (19-21). Additional complications include para- and postinfectious disorders and neuroinvasive disease. The latter is characterized by neuronal injury by the presence of SARS-CoV-2 in the CNS and an local inflammatory response (22). Longer term consequences of NeuroCOVID-19 are being researched; further insights are expected from international registries such as ENERGY, a database set up by the European Academy of Neurology (EAN) (23).

**Inequalities exposed by COVID-19: relevance for neurology**

Advanced age and comorbidities are significant risk factors for COVID-19 related fatality (24, 25). Many diseases of older age are neurological disorders, and elderly patients have a higher likelihood of pre-existing medical conditions. Patients with neurological disorders have more severe COVID-19 and higher mortality (26, 27).

The Global Burden of Disease 2017 study disclosed that neurological disorders are the third most common cause of disability and premature death in the European Union (28). The sheer number of patients at risk for unfavourable outcomes from COVID-19 underpins the importance of neurology in the multidisciplinary care of these patients (29). Maintenance of acute neurology services, inpatient and outpatient care and neurorehabilitation are needed more than ever. However, during this unprecedented public health crisis, these services are vulnerable and disruption may have a disproportionate impact on certain groups (30). Reports that outpatient clinics, neurology wards and rehabilitation facilities were either closed, reduced capacity or shifted treatment toward people recovering from respiratory infection are worrying.

Remote consultation can bridge gaps in outpatient care in some neurological subspecialties (31). Diagnosing neurological diseases is often dependent on physical neurological examination. As video conferencing and smartphone technologies have improved tremendously, even parts of the neurological examination can be applied via video consultation (32, 33). It needs to be considered, however, that the technical equipment may not be available on the hub site, a virtual consultation not available due to lack of reimbursement or in-house priorities shifted towards acute care in timed of COVID-19. Moreover, the necessity of familiarity with the technology means that problems may arise, e.g. for older people (34). This might be even more relevant if family members are unable to assist, particularly in the current times with restrictions based on social distancing. Availability of digital infrastructure and literacy is also related to socioeconomic status, so this represents another area where measures need to be considered to avoid discrimination (35).

Isolation can result in psychological distress among patients, families and health care staff. In a study from London, patients reported emotional, cognitive and physical concerns, and greater vulnerability to isolation and economic hardship (10). Families and carers reported increased distress arising from hospital lockdown. Healthcare workers reported distress, anxiety and reduced social support. Elderly people may also face discrimination. In a study from Israel, societal views of older adults were studied; perceptions of vulnerability and burden to society during the COVID-19 outbreak were reported (36).

**Access to COVID-19 diagnostics, vaccination and therapy: stopping inequality before it happens**

In low- and middle-income countries (LMIC), the direct and longer term socioeconomic consequences of the pandemic may be even more extensive due to fragility of pre-existing health care systems and shortages of resources (37). The next challenge will be to set up initiatives to stop inequality in all aspects related to COVID-19. From the medical perspective, there is a need to consider disparities in prevention, treatment and long-term consequences. Here, we provide a brief summary of ideas. We acknowledge that this list is incomplete, needs to be adapted to circumstances and may not be applicable in every setting.

1. The public health strategy of flattening incidence curves by primary prevention is a multi-facetted process. Timely diagnosis of individuals with COVID-19 requires unrestricted and widespread access to appropriate diagnostic testing. To prevent inequitable access to testing, neighbourhoods in lower income areas and communities with high proportions of ethnic minority residents may need to be actively prioritized for mass testing. Outreach schemes should be combined with educational initiatives regarding the importance of COVID-19 testing. Limited health literacy has the potential to undermine efforts to reduce viral transmission, as reported in a study from Australia (38). People with low health literacy had poorer understanding of COVID-19 symptoms, were less able to identify behaviours to prevent infection, and experienced more difficulty finding information and understanding government messaging about COVID-19.
2. Isolation of individuals diagnosed with COVID-19 and identification and quarantine of close contacts is another key step. For people living in challenging socioeconomic circumstances, sick leave, quarantine and COVID-19 in family members has far greater consequences. This disproportionate impact can be expanded to issues such as home schooling. Moreover, people with lower income are more likely to experience overcrowding in their household (39), posing a greater infection risk, especially if different generations cohabit together. Lower income may also be associated with higher SARS-CoV-2 transmission risks, for example through reliance on public transport or through occupation (40). Indeed, differences in the ability to reduce mobility and visiting more crowded points of interest may also account for higher infection rates in disadvantaged racial and socio-economic populations (41). Fully addressing these disparities is beyond the scope of this article.
3. Face masks combined with other preventive measures, such as frequent hand-washing and physical distancing, help to slow viral transmission (42). If mask costs need to be covered by individuals, differences in risk of contracting SARS-CoV-2 are predictable based on socioeconomic status.
4. Lockdown periods are public health measures proven to reduce viral transmission through reduced human interaction (43). Such drastic measures need to be accompanied by appropriate information campaigns. Groups with lower health- and technological literacy may require particular attention.
5. There is legitimate hope that a COVID-19 vaccine will bring the pandemic under control, when combined with appropriate mass testing and existing behavioural and non-behavioural prevention measures. When it comes to distributing COVID-19 vaccines (44), the major challenge will be to prevent the inequality gaps the pandemic has exposed from widening. The decision on whom to vaccinate first is a complex public health issue. In some settings, elderly people and people with comorbidities are being prioritized. In other settings, it may be populations most likely to become infected or more likely responsible for community spread who would be targeted (45). Demand for COVID-19 vaccines is likely to far exceed supply initially. More than 10 billion vaccines doses have been pre-ordered and the distribution has started. The 27 member states of the European Union together with five other countries account for about half of this order (46). Notably, these countries account for only around 13% of the global population. COVAX, a global alliance seeking to ensure that LMIC get adequate vaccine provision, has been able to secure vaccines for only around 250 million people (47). Considering anti-vaccine campaigns, clear communication on the basis for regulatory decisions including clinical trial and surveillance data will be necessary to provide clarity on advantages and safeguards in place and avoid the spread of “fake news”. To some extent, the skepticism towards vaccination may be cultural (48). Appropriate explanation of potential risks and uncertainties need to be tailored to individual groups. Lessons have been learned from polio, tuberculosis and measles vaccination campaigns, for which it is notable that unequitable distribution was a major reason for lack of complete eradication (49).
6. The discussion on a global strategy for equitable access to vaccination needs to be extended to the care of people infected with SARS-CoV-2. The major challenge will be to ensure equality of access, especially in countries without universal health coverage. There is a risk that costs associated with diagnosis and treatment of COVID-19 could further intensify disparities. For example, in relation to the use of antiinflammatory or antiviral therapy for SARS-CoV-2 infection and to emerging treatments such as monoclonal antibodies or convalescent sera, if they were to prove effective in trials. This consideration needs to be extended to non-restricted access to hospital beds, intensive care unit and ventilators, and rehabilitation services.
7. Criticism has been voiced against the formulation and implementation of “ageist” policy, whereby resources are prioritized based exclusively on patients’ chronological age (50). Older people from lower-income backgrounds are more likely to suffer from chronic conditions, multimorbidity and frailty. Older people from minority or disadvantaged groups may therefore face double discrimination, placing them in an extremely vulnerable situation. Self-isolating older adults are more likely to experience loneliness, difficulties obtaining food for a balanced diet, lack of exercise, and lower cognitive stimulation. These factors may considerably decrease their levels of resilience, leading to a cascade of physical and mental health problems, exacerbated by challenges maintaining social care and community support.

**Conclusion**

Lessons from previous epidemics and the current pandemic reinforce the need to take action against disparities in healthcare. Some of the issues of direct relevance to neurologists are outlined in this review. With this appraisal, the EAN NeuroCOVID-19 Task Force intends to raise awareness of the potential impact of COVID19 on inequalities in healthcare and calls for action to prevent disparity at individual, national and supranational level.

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