

COVID-19 responses in vulnerable populations: from clinical management to healthcare policies

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Healthcare for vulnerable populations, including but not limited to children, women (particularly during pregnancy), older adults, individuals with underlying long-term conditions, and those facing structural barriers associated with lower socio-economic status, remains one of the most formidable challenges in health protection and promotion worldwide. The advent of coronavirus disease 2019 (COVID-19) has exacerbated the vulnerability of these groups, placing them at greater risk of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection and worse health outcomes.¹ Global data indicate that COVID-19 has disproportionately affected these vulnerable groups, driven by a complex interplay of biological factors, social determinants, and overstretched healthcare services.²

A substantial body of evidence demonstrates the harmful and long-lasting consequences of COVID-19 on the development of children and adolescents, encompassing physical health, mental well-being, academic performance, and socio-emotional skills, both directly and indirectly.³ A recent review of the literature revealed that adolescents, children from ethnic minority backgrounds or lower-income families, and those with obesity were more susceptible to SARS-CoV-2 infection.⁴ While COVID-19 generally presents as a milder or moderate illness in children compared to adults, due to fundamental differences in immune responses, continued surveillance—such as wastewater monitoring and universal or pooled testing—remains critical to managing the spread of infection within communities.⁴ Serious conditions, although fortunately rare, require preparedness

and response efforts from frontline paediatricians and intensivists to provide optimal respiratory support. A framework for airway management procedures has been proposed, based on a comprehensive system incorporating respiratory pattern monitoring, spontaneous respiration oxygenation, apnoeic oxygenation, manual ventilation, and scavenging to reduce the risk of healthcare-associated transmission.⁵ Case reports have described adolescent patients presenting with rare conditions, such as laboratory-confirmed SARS-CoV-2 infection with chilblain-like lesions⁶ and paediatric multisystem inflammatory syndrome temporally associated with SARS-CoV-2 after recovery from COVID-19.⁷ Both cases suggest that paediatricians should remain vigilant for potential symptoms and signs to enable timely diagnosis and mitigate transmission risks.

Although vaccination has proven effective in reducing the severity of COVID-19 and providing protection against post-COVID-19 conditions, increasing concerns persist regarding the knowledge gap on long-term efficacy and potential adverse events associated with COVID-19 vaccines.^{4,8} Gut microbiota may play an important role in the immune response to vaccination, offering a promising avenue for management of vaccine-related adverse effects. A pilot study in Hong Kong demonstrated the safety and tolerability of a microbiota-derived health supplement among children aged 5 to 17 years.⁸ This supplement, administered prior to COVID-19 vaccination and continued for 7 days post-vaccination, showed potential for alleviating vaccine hesitancy among parents and children.⁸

The impacts of COVID-19 on the dramatically increased use of digital tools in school education have also attracted considerable public attention, partly due to mitigation strategies such as school closures and restrictions, which have affected at least half of the global student population.⁹ Despite rapid advances in virtual learning technology and home-schooling platforms, the prolonged reliance on remote or distance learning in response to the COVID-19 pandemic poses profound risks to the cognitive and social development of adolescents. These risks arise from the absence of physical interactions with peers and teachers during the transition to adulthood.⁹ Such effects may be more pronounced in children and youth with behavioural or intellectual disabilities who rely on special education support services. In resource-constrained settings or among low-income families, effective education time is often substantially reduced due to inadequate access to electronic devices and limited internet connectivity, thereby exacerbating academic inequality. Addressing this challenge may require sustained government investment in community-based, targeted socio-technical interventions to close the social class achievement gaps and reduce the digital divide.¹⁰

Excessive screen time resulting from increased reliance on digital media has led to a range of public health concerns, including asthenopia and vision impairment. A clinical assessment of visual acuity among school-aged adolescents in western rural China revealed a significantly higher prevalence of asthenopia and worsened vision impairment during the COVID-19 pandemic compared with the pre-pandemic period.¹¹ The striking progression of vision impairment highlights the urgent need for policymakers to develop system-level strategies and tailored guidelines aimed at promoting healthy screen time practices. Such measures are essential to address the increasing incidence of eye problems among students in the post-COVID-19 era, where digital media is deeply embedded in nearly every aspect of adolescents' daily lives.

Coronavirus disease 2019 also posed multiple challenges throughout pregnancy because pregnant women infected with the virus faced a higher risk of severe illness relative to their non-pregnant counterparts.¹² Additionally, they may experience exacerbation of COVID-19 symptoms due to reduced lung capacity associated with fetal growth and immune suppression during pregnancy.¹³ Although compelling evidence indicates that rigorous public health measures effectively mitigate the spread of SARS-CoV-2,¹⁴ pregnant women often exhibited high levels of anxiety about contracting COVID-19, largely due to their vulnerable immune status.¹⁵ This widespread anxiety may arise from perceived risks of pregnancy complications, fears of vertical

transmission to the newborn, and uncertainties regarding delivery and breastfeeding practices in the event of infection.¹⁵ These observations highlight the importance of ensuring enhanced laboratory support for universal screening and providing adequate personal protective equipment. Emotional support is equally important. Satisfaction with maternity care can be achieved through partner companionship during labour.¹⁵ A multidisciplinary approach involving expert teams has proven essential in providing optimal care.¹² However, changes to childbirth companionship and peripartum services during the COVID-19 pandemic frequently fell short of pregnant women's expectations, potentially leading to negative psychological consequences such as heightened antenatal anxiety and emotional disturbance.¹⁶ Guidelines and decision-making in obstetric practice must balance infection control measures with the peripartum needs of women; the nulliparous group requires additional attention.

Older patients with COVID-19 are considered among the most vulnerable groups during the pandemic because advanced age and co-morbidities are well-documented risk factors for mortality.¹⁷ Clinical findings have supported frailty screening as a reliable predictor of clinical deterioration and adverse outcomes in older patients upon hospital admission.¹⁷ Furthermore, older adults were more likely to remain at home during the pandemic, with limited access to recreational activities or social support, while facing an increased risk of elder abuse.¹⁸ Tackling these issues may require government-led legislation and integrated social welfare services to reduce vulnerability to abuse and neglect among older adults, particularly those residing in long-term care facilities.¹⁹

A recent global review examined national plans and policies on maternal, newborn, child, and adolescent health services, as well as health services for older people across 110 countries.²⁰ The findings revealed a significant knowledge gap, particularly regarding the absence of specific activities, monitoring indicators, or resource allocations aimed at mitigating potential service disruptions in the COVID-19 response and recovery plans. The insights gained from clinical management during this pandemic will undoubtedly inform the development of policy interventions and guide future interdisciplinary research to enhance preparedness for emerging and unforeseen public health challenges, ultimately improving health outcomes for vulnerable populations.

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