

COVID-19 and children: potential impacts and alleviation strategies

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Introduction

The coronavirus disease 2019 (COVID-19) pandemic, caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has caused numerous public health problems worldwide.¹ In the early pandemic period, more than 57 million people were infected across 220 countries or regions; the mortality rate was around 2.4%.^{2,3} Thus far, children have generally been spared from severe COVID-19; affected children are usually asymptomatic or display mild symptoms.^{4,5}

Nevertheless, COVID-19 has impacted children directly through SARS-CoV-2 infection and indirectly by altering education and healthcare; it has also led to social distancing, school closures, and other socio-economic changes.⁶ Impacts vary among communities depending on disease burden, viral containment approaches, local healthcare infrastructure, and support resources for children and families.⁷ Here, we discuss the impacts of COVID-19 on physical and mental health, education, and well-being in children, then examine approaches to alleviate such effects.

Impacts of coronavirus disease 2019 on children

Direct impact through illness

During the early pandemic period, relatively few COVID-19 cases involved children.⁸ Public health surveillance of COVID-19 cases differed among countries. Centralised reporting systems helped understand disease burdens and patterns; they also facilitated research concerning paediatric clinical manifestations and therapeutic advances. In the UK, Public Health England received notifications about confirmed cases and coordinated broad surveillance.⁹ In the US, local health departments reported confirmed cases to the Centers for Disease Control and Prevention.¹⁰

In 2020, most children with COVID-19 were asymptomatic or had mild/moderate disease.⁵ Approximately 2% to 6% of such children had critical illness requiring hospitalisation (mainly infants and children with underlying health conditions).^{4,5,11}

Some cases of multisystem inflammatory syndrome associated with SARS-CoV-2 were reported; 80% of affected children required intensive care, and the fatality rate was 2%.¹² The long-term health consequences of COVID-19 in children have not been fully elucidated.

Indirect impact on physical health

Health service disruption may have adverse physical consequences for children and adolescents. Coronavirus disease 2019–related changes in resources and public health policies led to the interruption of routine healthcare; routine medical consultations and procedures were also deferred. Individuals with non-epidemic–related health problems likely had greater difficulty in accessing healthcare services.¹³ The above factors contribute to ‘excess mortality’ from COVID-19.^{6,14} Statistical modelling of the indirect effects of COVID-19 suggested that 1.2 million additional child deaths and 56 700 additional maternal deaths would occur across 118 low- or middle-income countries.¹³ During the early pandemic period, many parents delayed or avoided seeking medical attention for their children because of COVID-19 risk. There have been consequences related to delayed presentation and diagnosis of critical illnesses.^{15–17} Some diagnostic delays arose from delayed referrals or the shift from in-person clinical evaluation to telemedicine.¹⁵ Delayed evaluation of critical illnesses may increase intensive care burden, morbidity, and mortality.^{15,16,18}

Routine vaccination rates declined during the early pandemic period. The uptake of key vaccines throughout the UK was 20% lower in 2020 than in 2019.¹⁹ In the US, a similar decline in vaccine uptake was observed after the national emergency declaration in 2020.²⁰ School closures influenced vaccination rates in communities where schools help provide routine vaccines to school-age children. Impacts were greatest in countries where the vaccine-preventable disease burden was high and mass vaccination campaigns were temporarily suspended. At least 13.5 million people were expected to miss vaccinations because of pandemic-related changes

in vaccination campaigns.²¹ Reduced vaccine uptake leads to a smaller vaccinated population and may increase the rates of some preventable infectious diseases.²²

Indirect impact on mental health

Social distancing, quarantines, and school closures have negative consequences. In 2020, about 60% of children worldwide were affected by lockdowns.²³ Diminished social contact and stress management can cause loneliness, depression, and anxiety,²⁴ leading to unhealthy behaviours that increase the risks of obesity and addiction.^{25,26} The lack of a daily routine affects sleep patterns, potentially influencing general health, mood, behaviour, and cognitive function.²⁷ In early 2020, a cross-sectional study of children in China revealed that 40.4% were susceptible to psychological problems; 14.4% had symptoms of post-traumatic stress disorder.²⁸ A large-scale survey of parents in the UK revealed that after 1 month of lockdown, many of their children displayed increased restlessness, along with greater emotional, behavioural, and attention difficulties; however, children with special educational needs exhibited fewer emotional difficulties.²⁹

The combination of a public health crisis, social isolation, economic recession, and limited mental health support can exacerbate existing mental health problems and create new problems. In some communities, schools help to provide mental health service support. In the US, school-based services were utilised by 57% of adolescents who accessed mental healthcare; the delivery of such services is directly affected by school closures.³⁰

Mortality often triggers bereavement and grief. One analysis indicated that each COVID-19–related death would cause bereavement in 2.2 children and 4.1 grandchildren.³¹ Grief differs according to age; adolescents may experience more intense grief, whereas younger children may become withdrawn, anxious or lose developmental milestones.^{32,33}

The indirect impact of COVID-19 on mental health in children is difficult to quantify. Academic researchers and non-governmental organisations have begun to investigate subtle effects, which may become apparent years after the pandemic subsides. For example, one large survey has enrolled >10 000 parents.²⁹

Indirect impact on education

School closures inevitably impact a child's education. At least 50% of the global student population was affected by school closures in early 2020.^{34,35} Many schools transitioned to remote learning and home-schooling platforms. Advances in virtual learning technology cannot counteract the disadvantages of decreased in-person interactions, loss of routines, reduced effective education time, and restricted

access to peers.²⁴ The impact of school closures was more pronounced in low-income countries where only 30% of students had remote learning access.^{23,36} In developed countries, underprivileged children experience remote learning challenges caused by inadequate electronic devices or insufficient internet access. Excess screen time and prolonged remote learning may lead to health problems.^{37,38} Extensive use of electronic devices, internet, and social media can increase the risks of cyberbullying, predator encounters, and harmful content exposure.^{37,39} Young children require physical interactions with classmates and teachers to support cognitive and social development.⁴⁰ In special needs schools, in-person learning involves various types of therapy and support that are absent from remote learning; without these support components, children experience rapid deterioration of learned skills and abilities.⁴¹ Telepractice by speech and language therapists has been implemented with limited effectiveness.⁴² Furthermore, children with special educational needs are strongly affected by loss of routine; they may become irritable, aggressive, and socially withdrawn.³⁷ Prolonged school closures may prevent these children from learning essential life skills, thus affecting their transition to adulthood.²³

Indirect impact on well-being

Global economic recession was indirectly caused by COVID-19. In 2020, the number of people living in extreme poverty was expected to increase by about 57%²³; children living in low-income countries were most likely to experience hunger and malnutrition. Food supplies can be affected by pandemic-related logistical difficulties in delivery to rural areas. Additionally, 346 million children across 161 countries rely on school meals; during school closures, they require alternative food sources. Unemployment during an economic recession can increase the likelihood that children and their families will experience distress, mental health issues, violence, and substance abuse.²⁴ Domestic violence and child abuse risks may increase in families where prolonged lockdown causes intense parental stress and anxiety, thus straining family dynamics.²³

Impacts in Hong Kong

Hong Kong mandated school closures considerably earlier than some other countries.^{43,44} The subsequent shift to remote learning presumably impacted learning experiences and academic progression. A large-scale cross-sectional study in Hong Kong showed that the risks of childhood psychosocial problems were greater among children with special educational needs and/or chronic diseases, and among single-parent and low-income households.⁴⁴

In 2020, Hong Kong required that all patients with COVID-19, including asymptomatic

individuals, were hospitalised and isolated until receiving laboratory-confirmed negative test results. In contrast, many other countries utilised at-home isolation for individuals with mild or asymptomatic COVID-19. Although the Hong Kong approach prevented disease spread during the early pandemic period,⁴⁵ hospitalisation-related separation of children and parents is stressful and traumatic. After quarantine, children may exhibit psychological distress, post-traumatic stress disorder, and long-term behavioural changes.^{46,47} Hospital infection control policies involving limited visitation may indirectly affect children hospitalised for other medical issues; such children may not receive appropriate parental care or allied health services.

Interventions and policies to alleviate impacts of coronavirus disease 2019 on children

In the early pandemic period, an effective COVID-19 treatment or SARS-CoV-2 vaccine was unavailable. In this context, communities must address the subtle physiological and psychological consequences of prolonged social distancing and self-isolation. Interventions and policies can be implemented at multiple levels. Below, we discuss strategies that have been and can be implemented to alleviate the impacts of COVID-19 on children's health and related services.

Global level: World Health Organization and other non-governmental organisations

In 2020, the World Health Organization began monitoring global COVID-19 spread and publishing disease management guidelines, strategic preparedness, and response plans that inform public health approaches and facilitate global research. In addition, the United Nations published guidance for nations and non-governmental organisations concerning protection against the impacts of COVID-19 on children worldwide, including the most vulnerable children living in low-income countries. It recommended a three-pronged approach: information to address pandemic impacts; solidarity among communities; and action by governments and policymakers to manage poverty, food supplies, child-centred services, and COVID-19-related services.²³

National level

Countries and governments

Governments implemented public health approaches to limit pandemic spread; most countries sought to minimise case numbers. Considering COVID-19 persistence in the foreseeable future, there is a need for normality when possible. Thus, governments should provide additional social and financial

support to vulnerable children, including children living in poverty, refugees, ethnic minorities, and children with chronic diseases, disabilities and/or special needs.²³ Also, governments should protect food supplies to prevent a food crisis; during school closures, they should provide alternative solutions for children dependent on school meals.

Health services

Essential health services should be maintained and elective health services should be restored when possible; disruptions of these services indirectly influence morbidity and mortality. Because compromises may be required, the World Health Organization has established high-priority categories: emergency and critical care services, communicable disease vaccinations, perinatal care and childbirth, and chronic disease management.⁷

The maintenance of essential services may involve additional healthcare resources; existing resources will require temporary redistribution. For example, intensive care unit and isolation facility capacity must be expanded. Strategies include extending working hours, employing retired healthcare workers, and rapid training for new healthcare workers. Innovative approaches to support routine healthcare services include the use of telemedicine for medical consultations and repeat prescriptions. Furthermore, play specialists can support children in public hospitals through online platforms and play materials. Finally, private doctors can be involved as partners in medical service provision to maintain community-wide service standards.

Vaccination is a key essential service. Parents should understand the importance of receiving vaccines when immunisation services resume. Healthcare systems must implement catch-up immunisation recovery programmes for efficient vaccine delivery while maintaining physical distancing¹⁹ (eg, via outdoor spaces and drive-in vaccine clinics). Healthcare services may maintain social distancing by bundling immunisation activities with other health services to reduce clinic visits and using scheduling systems to reduce risk for vulnerable patients. Catch-up immunisation programmes should identify individuals who have missed immunisations. Healthcare systems with limited resources should prioritise outbreak-prone preventable diseases. Governments should enhance public education regarding the importance of timely vaccination and implement measures to avoid COVID-19 transmission during vaccination. During prolonged school closures, parents should receive instructions to ensure that their children undergo routine vaccinations in a timely manner. To promote vaccine effectiveness, catch-up vaccination programmes should be implemented before schools reopen.

Because children are especially vulnerable, preventative measures must be established while restoring routine healthcare services. Enhanced COVID-19 surveillance throughout healthcare systems may help protect patients and healthcare workers. To manage the backlog of clinic appointments and surgeries, triage guidelines should prioritise urgent care. Telemedicine can expedite the resumption of health services through video consultations, particularly for patients with chronic illnesses and patients who live far from the hospital. This approach may also facilitate multi-professional consultations.

Parents and children require mental health support to ensure well-being during the pandemic. Professional paediatric organisations can supply parents and children with reliable COVID-19 information. During school closures, home routines are important. Parents should practise self-care to ensure that they remain calm and can reassure their children.

Restoration of in-person education

In-person education should be restored when circumstances allow. Universal precautions should include good hand hygiene, universal use of face masks, and social distancing. If resources are sufficient, universal screening for COVID-19 may be performed before schools reopen.

Conclusion

Global COVID-19 management efforts are demanding and long-lasting. Similar to past pandemics, COVID-19 may be contained but not eradicated. In the absence of effective treatments or vaccines, social distancing and self-isolation are important tools; however, they have long-term physiological and psychological consequences for children. Because many children have avoided direct effects of COVID-19, paediatricians should be vigilant about subtle indirect effects, which may manifest gradually and have complex adverse impacts. In addition to social distancing measures, public health entities should emphasise the importance of timely routine vaccinations and encourage parents to seek medical attention for their children as usual. Finally, the COVID-19 pandemic has exposed uncomfortable truths about existing inequalities, along with the negative effects of a global economic recession. Overall, countries and nations must collaboratively plan strategies for transitioning to a new normal after the pandemic subsides.

Author contributions

All authors contributed to the concept or design of the study, acquisition of the data, analysis or interpretation of the

data, drafting of the manuscript, and critical revision of the manuscript for important intellectual content. All authors had full access to the data, contributed to the study, approved the final version for publication, and take responsibility for its accuracy and integrity.

Conflicts of interest

As an editor of the journal, KL Hon was not involved in the peer review process. Other authors have no conflicts of interest to disclose.

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