



Perspective

Reopening of schools during COVID-19 pandemic: A persistent dilemma

The COVID-19 pandemic has considerably impacted the education systems across the world. It led to a shift from in-person interactive school curriculum to an abbreviated digital platform-based learning. It is estimated that one in seven children globally has missed more than three-quarters of in-person learning, thereby affecting their social, mental and physical development¹. The situation becomes worrisome in the Indian context where already widened learning inequities exist. However, there is a lack of scientific consensus on what is the appropriate time and approach to restore in-person learning among school children in India, even after 18 months into the pandemic with two distinct wave peaks being encountered; the first one in mid-September 2020 and the second during mid-May & June 2021.

Impact of school closure on children during COVID-19 pandemic

School closures in India for more than 500 days have affected over 320 million children as per the UNESCO report². Another School Children's Online and Offline Learning survey conducted across 15 States in the country, among children from 1362 sampled households of relatively deprived hamlets and *bastis* (slums) in August 2021, revealed that only eight per cent of school students in rural and 24 per cent in urban areas were studying regularly while nearly half of the respondents were not able to read more than a few words. Nearly three-quarters of the parents reported that their children's reading abilities had declined during the pandemic period and majority of the parents in urban and rural areas opined in favour of school reopening³. Another survey reported that while students and parents 'missed out on social interactions', 'lacked physical activity' and 'had a sense of losing bonds with friends due to prolonged school closures' during COVID-19 pandemic, teachers believed that the pandemic had caused irreparable damage on the

overall development of the future generation (personal communication).

Susceptibility of children

There is ample evidence to suggest that children aged 1-17 yr have similar susceptibility to mild form of SARS-CoV-2 infection as in adults. However, the risk of severe disease and mortality in children when compared to adults is much less⁴. This may be attributed to various factors⁵ including lower density of angiotensin converting enzyme-2 (ACE-2) receptors lining the respiratory tract of children that provides the site for binding domain of the spike protein of SARS-CoV-2. The fourth round of the National Serosurvey for COVID-19 held in June 2021 in India revealed that more than half of the children aged 6-17 yr were seropositive, which implicated that a considerable proportion of children became exposed to and infected with SARS-CoV-2 infection and the infection did not remain restricted to the adults only⁶. However, treatment centres did not experience attending to severely ill SARS-CoV-2 infected children with any greater frequency during the second wave of COVID-19 in May & June 2021 compared to the previous year, while adults were being treated in inpatient facilities in considerable number throughout the country⁷ coinciding with the rapid spread of delta variant in 2021. There are a few other considerations that should also be taken into account such as less onward transmission of SARS-CoV-2 infection by younger children than older children and adults⁴. Modification of transmission model fitted to the United Kingdom SARS-CoV-2 data revealed that reopening of schools with younger children was unlikely to push the reproductive number (R) above one while reopening secondary schools resulted in more number of cases as older students had their respective family members infected as well, while another school setting in Ireland did not report any secondary transmission^{8,9}.

Anecdotal evidence from India also points towards a sporadic increase in cases of COVID-19 across several States that initiated reopening of schools after the first wave of the pandemic¹⁰. All these considerations point towards over-dispersed phenomenon or heterogeneity in COVID-19 transmission in various settings. It should also be noted that global evidence suggests schools as 'non-drivers' of transmission of SARS-CoV-2 infection in the community¹¹.

School closure *vis-a-vis* waves of pandemic

Conceivably, prolonged school closure is associated with negative socio-economic impact and should be considered as a last resort to curb the spread of SARS-CoV-2 infection¹². Further, global evidence showed that the effectiveness of school closure in containing SARS-CoV-2 transmission declined during the second wave of the pandemic when compared with the first wave scenario^{4,8}. The benefits of reopening of school during the present scenario of COVID-19 in India (post-second wave) therefore, need to be assessed against the associated risks. Evidence indicates that restoration of functioning of the education system as it was in pre-COVID times, as early as possible appears prudent in the current Indian context. However, it would be necessary to examine the State-specific as well as district-specific data on earlier waves of infection and the status of adult vaccination coverage to project any plausible third wave¹³ and its potential intensity to inform such decisions related to schools reopening.

Multi-layered mitigation strategy

To obtain the maximum benefits of reopening of schools, it is important that proactive multi-layered mitigation strategies are devised to create optimal learning environment for the children with reduced risk of transmission. Indian and global experiences highlight multiple mitigation approaches for school reopening after COVID-19 pandemic closures^{10,12}. Physical and social distancing measures are being adopted such as limiting the number of students attending school in-person on a particular day (schools in Bihar, Haryana, Jharkhand and Uttar Pradesh), ensuring adequate gaps between desks occupied by children during a class (schools in Mizoram) and deploying time shifts wherein students of the same standard are attending classes over spread out time frame¹⁴. Hybrid model of education should continue with some students (especially those with immunosuppression or other underlying health conditions, undergoing treatment, or

those with family members who are at-risk) who may continue to receive online instructions full-time. Other students may attend school on alternate days or using a staggered schedule and experience both in-person and remote learning.

Consistent and appropriate use of mask, implementation of standard protocol for sanitization and hand washing are the key pillars of COVID appropriate behaviour and must be practiced by students and school staff alike. Ensuring the provision for such behaviour change practices requires planning and resource allocation by school authorities. The Ministry of Health and Family Welfare, Government of India, has recently issued guidance on wearing masks by children belonging to different age groups. While masks are not recommended for under-5 children, 6-11 yr old children may wear a mask depending upon their ability to use them safely and appropriately and children above 12 yr and older should wear masks under the same conditions as adults¹⁵.

Adequate ventilation is critical to prevent the spread of COVID-19. Therefore, schools should ensure that indoor spaces are well ventilated and wherever possible limit the time spent by the students in closed settings. Air conditioners should be avoided while exhaust fans should be installed in classrooms to create negative pressure for curtailing the potential spread. Noteworthy at this point is that historically, the guiding principle of imparting education in Santiniketan, a novel learning hub created by Rabindranath Tagore the Nobel Laureate and polymath-poet, writer, playwright, composer, philosopher, social reformer and painter, was to engage students with nature with classes being held in open air. Children usually sat beneath the trees in Santiniketan and were encouraged to engage with teachers in lively interactive classes¹⁶. COVID-19 has forced us to explore and discover innovative learning methods, particularly in nature's lap. Schools in many countries (the Netherlands, the US and Denmark) have been conducting classes in their open spaces¹⁷. Further, assembly halls and other large spaces may be used creatively for learning purposes. Children should be advised against sharing of meals or spending long hours in canteens or dining halls. Visible display boards with innovative behaviour change messages generated through active engagement of school children and teachers within the school premises could go a long way in this regard. Similar considerations should also be taken into account for ensuring safe transport

of children to and from the schools with particular attention to vaccination among transportation staff and mask use by them.

Identifying a signal early

It is well known that COVID-19 transmission is an 'over-dispersed' phenomenon. Therefore, testing strategies in school settings could serve as key interventions to check the potential spread of the virus. It must also be acknowledged that the testing strategies for SARS-CoV-2 infection in schools should act as adjunct and not substitute to other organizational and behavioural interventions. A stochastic individual-based model in Canada assessing as to what happens when an infected individual attends the class of susceptible individuals demonstrated that only frequent screening of the entire class was able to reduce the size of clusters substantively¹⁸. This observation points towards frequent testing of school staff and students for early detection of cases, which is essential to prevent outbreaks. Routine temperature or symptom checking in schools should be avoided due to limited evidence on their utility¹⁹. It is also recommended that schools should have access to onsite testing facilities as per existing country-specific guidelines¹⁹. Temporary or localized closures of a class or school may occur depending upon the local community transmission levels or if COVID-19 indicators worsen¹¹.

Engagement of teachers, students and parents

It is well known that COVID-19 vaccination is the key to managing the pandemic, reducing severity and mortality due to SARS-CoV-2 infection. Even though teachers have not been considered as a priority group for vaccination in India, the dynamic vaccination strategy recommended vaccination of all adults aged 18 yr and above in the country since May 1, 2021. Therefore, school teachers, staff and those involved in transportation of children should be vaccinated on emergent basis along with the adoption of mask use post-vaccination²⁰. This combination-intervention is critical as vaccination against COVID-19 does not prevent acquisition or transmission of infection, which holds true for adults and children alike. Opening of schools under this combination-intervention will ensure not only continuity of in-person learning but also instil confidence among parents that schools are safe for their children. Finally, active engagement of children in these conversations, particularly around peer group influence for mask use, could result in sustained behaviour change outcome.

Currently, COVID-19 vaccine trials for children and adolescents are still ongoing in India. The available evidence suggests that children aged 12 yr and above are at a high risk of contracting infection and therefore must be prioritized for vaccination compared to the younger children²¹.

To conclude, it is essential to realize the impact of prolonged school closures during the COVID-19 pandemic on overall development of the children. Therefore, schools need to be re-opened in a phased manner (beginning with primary schools followed by secondary schools) and allowed to remain open and safe with appropriate implementation of multi-layered mitigation measures where children's participation remains essential.

Conflicts of Interest: None.

**Tanu Anand¹, Balram Bhargava[†]
& Samiran Panda^{2,3,*}**

¹Clinical Studies, Trials & Projection Unit, ²Division of Epidemiology & Communicable Diseases, [†]Indian Council of Medical Research, New Delhi 110 029 & ³ICMR-National AIDS Research Institute, Pune 411 026, Maharashtra, India

*For correspondence:
pandasamiran@gmail.com

Revised & updated: September 2021

References

1. World Bank. *Policy actions for school reopening and learning recovery*. Available from: <https://www.worldbank.org/en/news/factsheet/2021/04/30/notes-on-school-reopening-and-learning-recovery>, accessed on May 11, 2021.
2. United Nations Educational, Scientific and Cultural Organization. *Education: From disruption to recovery*. Available from: <https://en.unesco.org/covid19/educationresponse>, accessed on September 14, 2021.
3. Locked Out. Emergency education report on school education. Available from: <https://counterviewfiles.files.wordpress.com/2021/09/locked-out-emergency-report-on-school-education-6-sept-2021.pdf>, accessed on September 14, 2021.
4. European Centre for Disease Control and Prevention. Technical Report. *COVID-19 in children and the role of school settings in transmission - second update*. Available from: <https://www.ecdc.europa.eu/sites/default/files/documents/COVID-19-in-children-and-the-role-of-school-settings-in-transmission-second-update.pdf>, accessed on August 25, 2021.
5. Zimmermann P, Curtis N. Why is COVID-19 less severe in children? A review of the proposed mechanisms underlying the

- age-related difference in severity of SARS-CoV-2 infections. *Arch Dis Child* 2020; 106 : 429-39.
6. India Today. *67% surveyed Indians have developed antibodies against coronavirus, 40 crore still at risk: Govt.* Available from: <https://www.indiatoday.in/coronavirus-outbreak/story/fourth-serosurvey-result-67-percent-indians-developed-antibodies-against-covid19-1830443-2021-07-20>, accessed on July 23, 2021.
 7. Kumar G, Mukherjee A, Sharma RK, Menon GR, Sahu D, Wig N, *et al*. Clinical profile of hospitalized COVID-19 patients in first & second wave of the pandemic: Insights from an Indian registry based observational study. *Indian J Med Res* 2021. doi: 10.4103/ijmr.ijmr_1628_21.
 8. Keeling MJ, Tildesley MJ, Atkins BD, Penman B, Southall E, Guyver-Fletcher G, *et al*. The impact of school reopening on the spread of COVID-19 in England. *Philos Trans R Soc Lond B Biol Sci* 2021; 376 : 20200261.
 9. Heavey L, Casey G, Kelly C, Kelly D, McDarby G. No evidence of secondary transmission of COVID-19 from children attending school in Ireland, 2020. *Euro Surveill* 2020; 25 : 2000903.
 10. The Lancet COVID-19 Commission. India task force. *Reopening schools after COVID-19 closures.* Available from: <https://static1.squarespace.com/static/5ef3652ab722df11fcb2ba5d/t/60a3cff2b425ae21a5b49405/1621348340073/India+TF+Reopening+Schools+April+2021.pdf>, accessed on May 28, 2021.
 11. Centers for Disease Control and Prevention. *Science brief: Transmission of SARS-CoV-2 in K-12 schools and early care and education programs – Updated.* Available from: https://www.cdc.gov/coronavirus/2019-ncov/science/science-briefs/transmission_k_12_schools.html#schools-cov2-transmission, accessed on August 30, 2021.
 12. Moro GL, Sinigaglia T, Bert F, Savatteri A, Grarano MR, Siliquini R. Reopening schools during the COVID-19 pandemic: Overview and rapid systematic reviews of guidelines and recommendation on preventive measure and the management of cases. *Int J Environ Res Public Health* 2020; 17 : 8839.
 13. Mandal S, Arinaminpathy N, Bhargava B, Panda S. Plausibility of a third wave of COVID-19 in India: A mathematical modelling based analysis. *Indian J Med Res* 2021. doi: 10.4103/ijmr.ijmr_1627_21.
 14. India Today. *These five states are reopening their schools, colleges from today.* Available from: <https://www.indiatoday.in/education-today/news/story/these-five-states-are-reopening-their-schools-colleges-from-today-1774160-2021-03-01>, accessed on May 14, 2021.
 15. Ministry of Health and Family Welfare, Government of India. *Guidelines for management of COVID-19 in children (below 18 years).* Available from: <https://www.mohfw.gov.in/pdf/GuidelinesforManagementofCOVID19inCHILDREN18June2021final.pdf>, accessed on August 28, 2021.
 16. The Better India. *Travel Tales: Exploring Tagore's Santiniketan, an abode of learning unlike any in the world.* Available from: <https://www.thebetterindia.com/66627/santiniketan-rabindranath-tagore-bengal/>, accessed on June 21, 2021.
 17. Learning Policy Institute. *Reopening schools in the context of COVID-19: Health and safety guidelines from Other countries.* Available from: <https://learningpolicyinstitute.org/product/reopening-schools-covid-19-brief>, accessed on May 28, 2021.
 18. Tupper P, Colijn C. COVID-19 in schools: Mitigating classroom clusters in the context of variable transmission. *PLoS Comput Biol* 2021; 17 : e1009120.
 19. World Health Organization (Regional Office for Europe). *Schooling during COVID-19. Recommendations from the European Technical Advisory Group for schooling during COVID-19.* Available from: <https://apps.who.int/iris/bitstream/handle/10665/342075/WHO-EURO-2021-2151-41906-59077-eng.pdf>, accessed on August 28, 2021.
 20. Panda S, Kaur H, Dandona L, Bhargava B. Face mask – An essential armour in the fight of India against COVID-19. *Indian J Med Res* 2021; 153 : 233-7.
 21. World Health Organization. *COVID-19 advice for the public: Getting vaccinated.* Available from: <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/covid-19-vaccines/advice>, accessed on September 16, 2021.