

Psychological Impact of COVID-19 on Children and Adolescents: A Systematic Review

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ABSTRACT

Background and aims: The outbreak of COVID-19 led to a significant psychological impact on individuals, particularly those belonging to vulnerable groups. This study aimed to synthesize literature on the psychological impact of COVID-19 among children and adolescents.

Methods: Electronic search engines were used to identify studies till March 2021 that reported symptoms of psychological origin in children and adolescents. Information was extracted using a predefined template, and qualitative analysis was conducted using STROBE.

Results: One hundred and two relevant papers were identified. Most of the studies were conducted online or telephonically. The study designs were primarily single group cross-sectional, though a few prospective/retrospective designs were also identified. Studies assessing emotional distress showed variable levels of anxiety and depressive symptoms in the study population, with greater severity of anxiety symptoms among females and older adolescents. Reduced physical activity; delayed sleep time; increased sleep duration, screen time, internet use, and sedentary habits, poor quality of life were other notable findings, often

correlating with anxiety/depression. Efforts to address bias, discussion on generalizability of their results, and sample size calculation were not reported in most studies.

Conclusion: Psychological impact on children/adolescents is significant, either due to the fear of the illness or social isolation related to COVID-19. One may focus on improving sleep habits and physical activity and regulating internet use for maintaining psychological well-being.

Keywords: COVID-19, social-isolation, children, adolescents, psychological impact

After the COVID-19 outbreak was declared a pandemic by the World Health Organization (WHO) in March 2020,¹ to contain the spread of this infection, nations across the globe have adopted various measures including nationwide lockdown, school closures, online lectures, and postponement of elective procedures. This has led to a psychological impact on various populations, particularly the vulnerable groups, like children, older adults, and healthcare and frontline workers.² In order to break the chain of social

transmission, based on evidence gathered from past influenza outbreaks, school closures were prolonged, even when various lockdown measures were lifted. The psychosocial impact of the pandemic and the social isolation on children are innumerable, including sleep problems, depressive and anxiety symptoms, worsening of preexisting psychiatric symptoms, etc.^{3,4} Some authors have even proposed a silver lining to the closure of schools and home confinement, such as delay in initiation of substance use and higher opportunity for the parents to bond with their children.⁵

There is now adequate literature on the psychological impact of COVID-19 on children and adolescents. Various systematic reviews have been done focusing on the psychosocial impact of COVID-19 on children/adolescents.^{6,7} However, one of them focused only on one set of population, that is, adolescents only,⁷ and the other was conducted after only three months of declaration of the pandemic,⁶ resulting in a modest sample size of 4 and 12 studies, respectively. Moreover, the search terms used in these reviews have either been ill-defined or limited

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in number which might have resulted in the extraction of very few studies. With ever-emerging literature on this topic, it is imperative to update and synthesize the findings to date. Thus, the present review aims to appraise the literature from across the globe on the psychological impact of COVID-19 and its associated situations, like social isolation and quarantine, on children and adolescents, and descriptively assess their quality.

Materials and Methods

Search Strategy

The PRISMA guidelines for systematic reviews and meta-analysis were employed for the conduct of the literature search following a systematic and structured approach.⁸ Major medical, health, and psychological literature databases, PubMed and Cochrane, were searched using the MeSH terms (((“COVID-19”[Title/Abstract] OR “COVID-2019”[Title/Abstract] OR “severe acute respiratory syndrome coronavirus 2”[Title/Abstract] OR “2019-nCoV”[Title/Abstract] OR “SARS-CoV2”[Title/Abstract] OR “2019nCoV”[Title/Abstract] OR “coronavirus”[Title/Abstract])) AND ((“Children”[Title/Abstract] OR “Child”[Title/Abstract] OR “Adolescent”[Title/Abstract] OR “Toddler”[Title/Abstract] OR “Preschooler”[Title/Abstract] OR “Paediatric”[Title/Abstract])) AND ((psychiatr* OR psycholog* OR mental OR “mental health” OR “mental illness” OR “mental outcomes” OR “mental disorder” OR depress* OR anxiety OR stress* OR “posttraumatic stress” OR PTSD OR wellbeing OR well-being OR mood* OR insomnia OR “coping” OR “Sleep” OR “Eating disorder” OR “behavioral changes” OR “ADHD” OR “Autism” OR “Intellectual disability”)) till March 12th, 2021. In addition, we also searched for these terms in the WHO Global Health research database on COVID-19.

Selection Criteria

Observational and exploratory quantitative studies with their full texts in English language were searched. The studies with focus on psychological effects, stress, communication issues, or sleep disturbances in children/adolescents were included. Psychological impact was operationalized as

“symptoms of emotional distress, such as anxiety/depression/post-traumatic stress disorder experienced by the patients, or behavioral changes such as irritability, increased use of internet or increased screen time, onset or increase in substance-related behavior observed by the parents/guardians, or changes in sleep pattern, quality, and duration.” Studies on experiences of children or adolescents, and parents’ perception of behavioral changes in their children were also included. Both direct (being infected with COVID-19) and indirect (social isolation, quarantine, school closure) effects of COVID-19 were considered for inclusion.

Studies done in children/adolescents with psychiatric (Attention deficit hyperactivity disorder, autism, intellectual disability, etc.) or physical (obesity, cystic fibrosis, cancer, etc.) comorbidity were excluded. We also excluded record-based studies assessing changes in the rates or statistics of an event (e.g., emergency visits, suicide rates, maltreatment cases, etc.) Studies assessing the physical effects, immunological markers, or genetics of COVID-19, and studies carried out on adults (more than 18 years) were excluded from the review. Studies assessing anxiety among parents or caregivers of children with special needs during COVID-19 were also excluded. Articles written in languages other than English were also excluded. Inclusion in the final review was done after assessing the titles, abstracts, and full text of the articles. After the search, the reference lists of the shortlisted articles were also scanned for papers that might have been missed.

Data Extraction and Qualitative Assessment

Data extraction was carried out by three authors (NC, MSS, AT) independently. Quality appraisal of the included studies was carried out using the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) checklist for quantitative studies by two authors (AT and MSS). Parameters explored by each author included authors with the year and place of study, type of study, study participants, the parameter being assessed, and each study’s results. Compilation by each author was compared,

and any discrepancies were resolved by mutual consensus. The findings were summarized and synthesized, and presented in the form of tables. Quantitative synthesis (meta-analysis) of the literature was not done as a part of the review.

Results

Our literature search found 102 relevant studies pertaining to the psychological impact of COVID-19 on children/adolescents. Out of these 102 studies, four, showing results from original research work, were published as letters to the editor. The studies are presented in **Tables S1–S4**, categorized into behavioral problems (**Table S1**), emotional problems (**Table S2**), sleep problems (**Table S3**), and findings on well-being/resilience/coping/quality of life/correlations with parental stress (**Table S4**). From the studies conducted on both parents and children/adolescents, only the findings pertaining to children’s/adolescents’ mental health have been highlighted in the tables.

Maximum studies ($n = 27$) were conducted in China. The study design in most studies was single cross-sectional observational, except eleven studies that had a prospective/retrospective design (retrospective data being commonly taken from electronic health records).^{9–19} Almost all of them were conducted through online survey or telephonic interviews. The sample size ranged from 61 to nearly 10,000. One study even had an enormous sample size of 1,199,320.²⁰ Age range of the sample population ranged from 6 to 18 years in majority of the studies. However, preschoolers were also enrolled in some studies.^{10,16,21–24} In certain studies, adolescents were taken up to 20–24 years of age.^{25–27} In majority of the studies, parents were assessed or interviewed solely or additionally about the changes in their wards’ behavior patterns and emotions. Average age of parents was in late thirties or early forties in most studies.

The majority of studies assessing symptoms of distress looked into the prevalence of depressive and anxiety symptoms during COVID-19. Behavioral changes most often assessed included screen time or internet use and changes in physical activities, which showed correlations with emotional symptoms’ severity. While the most commonly used

scales for emotional and behavioral problems were Patient Health Questionnaire, 7-item Generalized anxiety disorder scale, Screen for Child Anxiety Related Emotional Disorders, and Strengths and Difficulties Questionnaire, the most common assessment method across different types of studies remained self-constructed questionnaires.

Studies on Behavioral Changes with Emotional Changes

Table S1 shows the summary of studies assessing behavioral changes along with emotional changes during COVID-19. While self-constructed questionnaire was the most common form of assessment used in the studies, SDQ was the most common standardized scale used to assess behavioral difficulties. The commonest changes found in behavior included reduced physical activity, increased sedentary habits, and increased screen time or technology/social media usage. One study discussed increased intake of alcohol and cannabis.²⁸ Some studies also showed increased use of social media, television, and smartphone among children, often correlating with severity of anxiety. Association of increased stress or symptoms of emotional distress with reduced physical activity was a common finding.

Symptoms of Emotional Distress

Table S2 shows the summary of studies assessing symptoms of emotional distress. Overall findings showed variable levels of anxiety and depressive symptoms in the study population, with a few studies estimating that nearly half the individuals studied had depressive or anxiety symptoms. The most common range, however, was 10%–30%. Most studies used a screening questionnaire and stated their findings as “symptoms” rather than “disorder.” The majority of studies that assessed sex and age differences in the psychological impact showed greater severity, particularly of anxiety symptoms, among females and older adolescents.

Impact on Sleep

Table S3 summarizes studies done on the impact of COVID-19 and its related

situations on sleep. Most studies assessing sleep patterns and quality showed worsening in the form of increased sleep latency and duration of sleep (increase in sleep timings) and a reduced overall sleep quality.

Studies on Quality of Life/Well-being/Coping/Resilience

Table S4 shows miscellaneous studies identified on quality of life, coping, resilience, association with parental practices, and stress. Most studies showed a poorer quality of life, stress correlating with parental practices, and parental stress. However, most adolescents, as per different studies, showed adaptive behavior and positive coping.

Qualitative Assessment

The quality assessment of the studies is shown in **Table S5** (excludes data published in the form of letters to the editor). The clear rationale for conducting the study, assessment instruments, and outcome data were clearly defined in all the studies (100%). Some elements were missed by almost 40%–50% of the studies, such as describing the study type and population discretely in their title, clear specification of the study’s objectives, and discussing the generalizability of the findings. Efforts to address potential sources of bias, and how the sample size was arrived at, were explained in less than 12% of studies.

Discussion

The current review represents literature about the psychological impact on children/adolescents during the time of COVID-19. Psychological impact during COVID-19 seems to be partially driven by the fear related to COVID-19 and partially, the indirect effect of COVID-19, that is, the situations created in the environment due to lockdown, school closures, quarantine, etc.^{29,30} A wide variety of symptoms have been reported amongst children in varying severity and prevalence, as depicted in the current review. These findings echo the findings from the adult population, estimating higher rates of depressive and anxiety symptoms than the general population.³¹

Among individual psychological symptoms, depressive symptoms were the most prevalent in most studies, followed by anxiety symptoms. However, different scales that measure variable constructs were used in different surveys. Moreover, the findings have been synthesized from different parts of the globe and at different time points (immediately during lockdown to months after lockdown), thus explaining the spatial, cultural, and temporal variations in the findings. It is also important to take into consideration the type of survey, the age group evaluated (preschoolers/school-going/adolescents), parental factors (employment, education, psychological state, relationship with the child), the influence of social media and news in the region, and various other cross-cultural factors (type of family, number of siblings, living with grandparents, family values, and usual bonding between children, parents, and other household members). All such factors have been found to influence the emotional health of children and adolescents, as depicted in our review.

An increase in the time spent using social media and smart phones and a sedentary lifestyle correlated with symptoms of anxiety and depression. Exercise has been shown to reduce the symptoms of anxiety and depression.³² Lack of exercise and physical activity during the COVID-19-associated restrictions may have confounded or aggravated the association of anxiety/depression with COVID-19 and related situations. Lack of outdoor activities paved the way for more indoor activities for children/adolescents. The increased amount of time spent using smartphones/internet has implications in leading to poor mental health.³³ The same findings have also been replicated by the studies included in the review. However, the conclusions must be made keeping in mind that the internet is also the source of education for most school-going children during the COVID-19 pandemic.

Various studies had focused on disturbances in children’s/adolescents’ sleep during COVID-19. Delayed sleep timings, increased duration, worsening of sleep quality, and disruption or reversal of circadian rhythm (all correlating with the levels of stress or psychological symptoms) were some common findings across studies (**Table S3**). Similarly,

delay in sleep timings, loss of sleep, and disruption of the circadian rhythm also negatively affect psychological health.³⁴ Delayed sleep onset has been associated with depressive symptoms.³⁵ So, the association of sleep disturbances with COVID-19 as identified in our review may be an association of symptoms of emotional disturbance occurring in response to COVID-19-related restrictions, a consequence of increased screen time/sedentary lifestyle, or an independent phenomenon.

In addition to the assessment of psychological impact, some studies also evaluated the children's knowledge about COVID-19, their source of information, and their compliance to the measures dictated to prevent the spread of COVID-19.³⁶⁻³⁹ While a large majority were seen to be following at least some social distancing, most of them were not able to follow all the measures outlined to prevent the spread. A sense of social responsibility was seen to be associated with a higher prevalence of following the hygiene and sanitization measures as well as social distancing. Similar findings have been observed in adults aged 18-59 years who reported avoiding going out (74.2%), going to crowded places (72.7%), and attending social gatherings of more than four people (59.7%). It has been seen that poor social distancing measures are associated with higher levels of anxiety and depressive symptoms in adults.⁴⁰

Quality appraisal of the studies was done using STROBE. The quality of the included studies can have implications on the generalizability of the results. This makes it important to assess the quality of the studies in a review. Sample size calculation was not attempted in many studies, while almost none of the studies reported any attempts to address potential bias. The titles of many studies were inadequate, lacking particularly in specifying the type of study. In almost half of the included studies, the authors had not specified discrete objectives and often failed to comment upon the generalizability of their findings.

There are several implications from the present review. First and foremost, psychological symptoms of distress are common in children during COVID-19 and have been found to be higher than in the general population in the pre-COVID era.⁴¹ It is important to focus

on adequate sleep habits and physical activity within the limits of physical distancing for improving mental well-being in children/adolescents. Also, due to fear of contracting COVID-19, one may not seek professional help for their children's behavioral and emotional changes. Second, those who are fearful may paradoxically be less compliant with hygiene and preventive measures. Such children must be screened for any psychological symptoms. Third, parents should be advised to use the "free time" to better bond with their children so that they are not engaged in excessive use of social media, which has been shown to correlate with higher severity of anxiety and depressive symptoms.

Some gaps in the current literature include the limited number of prospective studies. Prospective assessment of psychological symptoms over time as the environmental situations change (e.g., reduction in media coverage of COVID-19-related morbidities/mortality, relaxation in lockdown restrictions, opening of schools) is worth exploring. Similarly, prospective assessment of children with preexisting psychiatric illness or family history of psychiatric illness may provide new insights into the issue. In addition, almost all the studies have been conducted online, which have been suspected of overestimating the actual prevalence.⁴² Although operationally questionable, but with the opening up of routine out-patient services, physical interview and assessment may help in a more accurate estimation of psychological impact related to COVID-19.

Moreover, studies that have assessed smartphone/internet usage during COVID-19 have not separately evaluated the time spent on a smartphone for education-related activities. In addition, a variety of instruments have been used for assessment, which makes comparisons difficult, and concurrence of psychological symptoms according to various scales should also be studied. Another gap in the current literature is the lack of studies that assessed the correlation of clinical variables, like temperament, family history, COVID status/severity, etc., with psychological dysfunction. To our knowledge, only one study has been done till now on COVID positive children/adolescents.⁴³ Future research should explore the

longitudinal course of psychological symptoms, especially in connection to the changes in the prevailing situation (lockdown/relaxation in lockdown restrictions, home isolation/hospitalization, closure/re-opening of schools). Studies may also look at the help-seeking regarding the psychological symptoms associated with COVID-19.

Some limitations of the present review should be considered while drawing inferences from the findings. We did not conduct a meta-analysis of the study findings, which did not allow summary analysis. In addition to PubMed and Cochrane, only the WHO Global Health research database on COVID-19 was the database used in searching the articles. Thus, some studies might have been missed, though we attempted to gather all relevant literature. Also, we did not venture into the impact of COVID-19 and its related situations on patients with preexisting psychiatric/physical illness and studies on the prevalence of COVID-19 among psychiatry in-patients/out-patients, if any. Only articles written in the English language were considered for this review. The studies' quality appraisal was done using the STROBE checklist, which is actually a reporting guideline for quantitative studies. But since there are no other tools available to assess the quality of such studies comprehensively and since it is commonly used in similar studies, we had to resort to the same.

Conclusion

COVID-19 impacts the mental health of youth, particularly causing symptoms of anxiety and depression. The teachers or parents should also be vigilant to identify behavioral and emotional changes in their students or children during this time so that early management can be sought. Measures may also be taken up at the government and administrative level to screen vulnerable children, like those infected with COVID-19, or with COVID-19 affected family members/parents, or those with a family history of psychiatric illness. It is imperative to gather more empirical evidence on the impact of the pandemic on youth's mental health, using robust study designs and standardized assessment tools.

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References

1. Timeline: WHO's COVID-19 response [Internet]. <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/interactive-timeline> (2019, accessed 27 October 2020)
2. Kuy S, Tsai R, Bhatt J, et al. Focusing on vulnerable populations during COVID-19. *Acad Med.* 2020; 95(11): e2–e3.
3. Gupta S and Jawanda MK. The impacts of COVID-19 on children. *Acta Paediatr* 2020; 109(11): 2181–2183.
4. Ghosh R, Dubey M, Chatterjee S, et al. Impact of COVID-19 on children: special focus on psychosocial aspect. *Minerva Pediatr* 2020; 72: 226–235.
5. Chawla N, Sharma P, and Sagar R. Psychological impact of COVID-19 on Children and adolescents: is there a silver lining? *Indian J Pediatr* 2021; 88(1): 91.
6. Nearchou F, Flinn C, Niland R, et al. Exploring the impact of COVID-19 on mental health outcomes in children and adolescents: a systematic review. *Int J Environ Res Public Health* 2020; 17: 8479.
7. Octavius GS, Silviani FR, Lesmandjaja A, et al. Impact of COVID-19 on adolescents' mental health: a systematic review. *Middle East Curr Psychiatry* 2020; 27: 72.
8. Moher D, Shamseer L, Clarke M, et al. Preferred reporting items for systematic review and meta-analysis protocols (PRISMA-P) 2015 statement. *Syst Rev* 2015; 4(1): 1.
9. Poulain T, Meigen C, Sobek C, et al. Loss of childcare and classroom teaching during the Covid-19-related lockdown in spring 2020: a longitudinal study on consequences on leisure behavior and schoolwork at home. *PLoS One* 2021; 16: e0247949.
10. Markovic A, Mühlematter C, Beaugrand M, et al. Severe effects of the COVID-19 confinement on young children's sleep: a longitudinal study identifying risk and protective factors. *J Sleep Res* 2021; 18: e13314.
11. Magson NR, Freeman JYA, Rapee RM, et al. Risk and protective factors for prospective changes in adolescent mental health during the COVID-19 pandemic. *J Youth Adolesc* 2021; 50: 44–57.
12. Lorenzo NE, Zeytinoglu S, Morales S, et al. Transactional associations between parent and late adolescent internalizing symptoms during the COVID-19 pandemic: the moderating role of avoidant coping. *J Youth Adolesc* 2021; 50: 459–469.
13. Giménez-Dasi M, Quintanilla L, Lucas-Molina B, et al. Six weeks of confinement: psychological effects on a sample of children in early childhood and primary education. *Front Psychol* 2020; 11. DOI: 10.3389/fpsyg.2020.590463
14. Chen I-H, Chen C-Y, Pakpour AH, et al. Problematic internet-related behaviors mediate the associations between levels of internet engagement and distress among schoolchildren during COVID-19 lockdown: a longitudinal structural equation modeling study. *J Behav Addict* 2021; 10. DOI: 10.1556/2006.2021.00006
15. Chen I-H, Chen C-Y, Pakpour AH, et al. Internet-related behaviors and psychological distress among schoolchildren during COVID-19 school suspension. *J Am Acad Child Adolesc Psychiatry* 2020; 59: 1099–1102.e1.
16. Aguilar-Farias N, Toledo-Vargas M, Miranda-Marquez S, et al. Sociodemographic predictors of changes in physical activity, screen time, and sleep among toddlers and preschoolers in Chile during the COVID-19 pandemic. *Int J Environ Res Public Health* 2021; 18: 176.
17. Alves J, Yunker AG, DeFendis A, et al. Children's anxiety and physical activity during COVID-19 in relation to prenatal exposure to gestational diabetes. medRxiv. Epub ahead of print August 7, 2020. <http://medrxiv.org/lookup/doi/10.1101/2020.08.06.20169565>
18. Philippe K, Chabanet C, Issanchou S, et al. Child eating behaviors, parental feeding practices and food shopping motivations during the COVID-19 lockdown in France: (how) did they change? *Appetite* 2021; 161: 105132.
19. Liu Z, Tang H, Jin Q, et al. Sleep of preschoolers during the coronavirus disease 2019 (COVID-19) outbreak. *J Sleep Res* 2021; 30(1): e13142.
20. Qin Z, Shi L, Xue Y, et al. Prevalence and risk factors associated with self-reported psychological distress among children and adolescents during the COVID-19 pandemic in China. *JAMA Netw Open* 2021; 4: e2035487–e2035487.
21. Dellagiulia A, Lionetti F, Fasolo M, et al. Early impact of COVID-19 lockdown on children's sleep: a 4-week longitudinal study. *J Clin Sleep Med* 2020; 16: 1639–1640.
22. Glynn LM, Davis EP, Luby JL, et al. A predictable home environment may protect child mental health during the COVID-19 pandemic. *Neurobiol Stress* 2021; 14: 100291.
23. Di Giorgio E, Di Riso D, Mioni G, et al. The interplay between mothers' and children behavioral and psychological factors during COVID-19: an Italian study. *Eur Child Adolesc Psychiatry* 2020; 31: 1–2.
24. Tso WWY, Wong RS, Tung KTS, et al. Vulnerability and resilience in children during the COVID-19 pandemic. *Eur Child Adolesc Psychiatry* 2020; 17: 1–6
25. Gotlib IH, Borchers LR, Chahal R, et al. Early life stress predicts depressive symptoms in adolescents during the COVID-19 pandemic: the mediating role of perceived stress. *Front Psychol* 2020; 11: 603748.
26. Matovu JKB, Kabwama SN, Ssekamatte T, et al. COVID-19 awareness, adoption of COVID-19 preventive measures, and effects of COVID-19 lockdown among adolescent boys and young men in Kampala, Uganda. *J Community Health* 2021; 22: 1–2
27. Commodari E and La Rosa VL. Adolescents in quarantine during COVID-19 pandemic in Italy: perceived health risk, beliefs, psychological experiences and expectations for the future. *Front Psychol* 2020 Sep 23; 11: 2480
28. Dumas TM, Ellis W, and Litt DM. What does adolescent substance use look like during the COVID-19 pandemic? Examining changes in frequency, social contexts, and pandemic-related predictors. *J Adolesc Health* 2020; 67: 354–361.
29. Carvalho Aguiar Melo M and de Sousa Soares D. Impact of social distancing on mental health during the COVID-19 pandemic: an urgent discussion. *Int J Soc Psychiatry* 2020; 66: 625–626.
30. Vernooij-Dassen M, Verhey F, and Lapid M. The risks of social distancing for older adults: a call to balance. *Int Psychogeriatr* 2020; 32(10): 1235–1237.
31. Rajkumar RP. COVID-19 and mental health: a review of the existing literature. *Asian J Psychiatry* 2020; 52: 102066.

32. Sharma A, Madaan V, and Petty FD. Exercise for mental health. *Prim Care Companion J Clin Psychiatry* 2006; 8: 106.
33. Sohn SY, Rees P, Wildridge B, et al. Prevalence of problematic smartphone usage and associated mental health outcomes amongst children and young people: a systematic review, meta-analysis and GRADE of the evidence. *BMC Psychiatry* 2019; 19: 356.
34. Walker WH, Walton JC, DeVries AC, et al. Circadian rhythm disruption and mental health. *Transl Psychiatry* 2020; 10: 1–13.
35. Glozier N, O'Dea B, McGorry PD, et al. Delayed sleep onset in depressed young people. *BMC Psychiatry* 2014; 14: 33.
36. Saurabh K and Ranjan S. Compliance and psychological impact of quarantine in children and adolescents due to Covid-19 pandemic. *Indian J Pediatr* 2020; 87: 532–6.
37. Esposito S, Giannitto N, Squarcia A, et al. Development of psychological problems among adolescents during school closures because of the COVID-19 lockdown phase in Italy: a cross-sectional survey. *Front Pediatr* 2021 Jan 22; 8: 975.
38. Xue Q, Xie X, Liu Q, et al. Knowledge, attitudes, and practices towards COVID-19 among primary school students in Hubei Province, China. *Child Youth Serv Rev* 2021; 120: 105735.
39. Buzzi C, Tucci M, Ciprandi R, et al. The psycho-social effects of COVID-19 on Italian adolescents' attitudes and behaviors. *Ital J Pediatr* 2020; 46: 69.
40. Zhao SZ, Wong JYH, Wu Y, et al. Social distancing compliance under COVID-19 pandemic and mental health impacts: a population-based study. *Int J Environ Res Public Health* 2020 Jan; 17(18): 6692.
41. Merikangas KR, Nakamura EF, and Kessler RC. Epidemiology of mental disorders in children and adolescents. *Dialogues Clin Neurosci* 2009; 11: 7–20.
42. Sagar R, Chawla N, and Sen MS. Is it correct to estimate mental disorder through online surveys during COVID-19 pandemic? *Psychiatry Res* 2020; 291: 113251.
43. Kılınçel Ş, Altun FT, Nuryüz Ö, et al. Effects of COVID-19 outbreak on children's mental health: a comparative study with children diagnosed and isolated from their parents. *Psychiatry Investig* 2021; 18: 140–146.