EUROPEAN JOURNAL OF BIOMEDICAL AND PHARMACEUTICAL SCIENCES
http://www.ejbps.com

ISSN 2349-8870
Volume: 8
Issue: 7
426-430
Year: 2021

IMPACT OF COVID-19 IN PEDIATRIC AGE GROUP: A STUDY DESCRIBING THE EFFECT OF THE PANDEMIC ON THE CLINICAL, PHYSIOLOGICAL & PSYCHOLOGICAL ASPECT OF THE CHILDREN

[1]Dr. Devesh Bhomia and [2]*Dr. Neha Bhomia

[1]Associate Professor, General Surgery, S.K. Government Medical College, Bajaj Gram, Sikar.
[2]Research Scientist (Medical), ICMR Project, Department of Microbiology, SMS Medical College, Jaipur.

***Corresponding Author: Dr. Neha Bhomia**
Research Scientist (Medical), ICMR Project, Department of Microbiology, SMS Medical College, Jaipur.

Article Received on 05/05/2021 **Article Revised on 26/05/2021** **Article Accepted on 16/06/2021**

ABSTRACT
Introduction: COVID-19 is a novel infectious disease declared as a pandemic. It is rapidly spreading worldwide, infecting and killing thousands of people. It has been seen that the children comprise a small fraction of COVID-19 cases, clinical features usually include fever and cough, but a large proportion of infected children appears to be asymptomatic and may contribute to transmission. Differences in the expression/function of the cellular receptor for Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Angiotensin converting enzyme 2 (ACE2) might explain the fact that why children are less severely affected then young adults and elderly people. **Objectives:** The aim of the present study was to examine the clinical, physiological & psychological impact of the COVID-19 on children from 5-11 years of age. **Methods:** A total of 200 parents having children aged between 5 and 11 years completed an online survey which included a set of questionnaires to measure the clinical, behavioral and emotional state of their children. **Results:** In our study, the data collected from the online survey filled up by the 200 parents showed that the 11.5% children were not tested for COVID-19, 33.5% of children were tested positive and 21% children were tested negative. It's important to note here that 40% children in our study were asymptomatic, 26% had low grade fever, 10.5% complained of sore throat, 5% had cough, 5% complained of abdominal pain & diarrhea, 2.5% had nasal congestion and myalgia. However, nausea, vomiting and headache in children were not reported. Parents stated changes in their children's emotional state and behaviors during the pandemic too. It was found that 48% children were impatient, 48% were anxious, 52% were depressed, 19.5% had nightmares and 35% reported to be angry most of the times. Decreased in diet was reported in 76% children. Irritability, restlessness, anger, anxiety, sadness, worries and being likely to argue with the rest of the family was reported by more than 30% of the parents. Children spent significantly more time using screens, and less time doing physical activity and sleeping. **Conclusion:** The findings emphasized the importance of developing prevention programmers to mitigate the impact of COVID-19 pandemic on children's psychological wellbeing.

KEYWORDS: COVID-19, SARS-CoV-2, pandemic, children, psychological health.

INTRODUCTION
Since first being reported in Wuhan, China in December 2019, COVID-19 has rapidly spread to affecting over 200 countries worldwide. Children account for 1-5% of diagnosed COVID-19 cases[1]; although, many infected children may be asymptomatic and therefore not diagnosed without population screening.

Coronaviruses are of different types, e.g., severe acute respiratory syndrome coronavirus (SARS-CoV), Middle East respiratory syndrome coronavirus (MERS-CoV), and have caused serious human illnesses.[2] SARS-CoV-2, the virus that causes COVID-19, is a newer form, which has been newly diagnosed in humans. It is an enveloped RNA virus with positive-sense RNA genomes ranging from 25.5 to 32 KB in length. It is spherical in shape and ranges from 70-120 nm in diameter with four structural proteins. The viral envelope is covered by characteristic spike-shaped glycoproteins (S) as well as the envelope (E) and membrane (M) proteins.[3] Studies have suggested that it can spread through close contacts and nosocomial secretions by coughing or sneezing. Furthermore, the fecal-oral route has also been suggested as a mode of transmission.[4] People can protect themselves from being infected by washing hands frequently, avoiding touching the face, and avoiding close contacts, especially with people who are sick. Epidemics or pandemics, such as COVID-19, produce potential risks to child development due to the risk of illness, protective confinement, social isolation, and the

increased stress level of parents. This situation becomes an adverse childhood experience (ACEs) and may generate toxic stress, with consequent potential losses for brain development, individual and collective health, and the long-term impairment of cognition, mental and physical health, and working capacity of future adults. Studies to improve the understanding of the impact of epidemics and pandemics such as COVID-19 on children's mental health and development can help to guide strategies to prevent damage to children's growth and promote positive development. There are several factors that influence the physical and mental health of children and adolescents experiencing the stress inherent in a pandemic, such as isolation itself, school shutdown, reduced social life and physical activities, changes to routine, sleep difficulties, exposure to disharmony at home, excessive screen use, unhealthy diet, and others. Depending on levels and kinds of support, high and continuous stress may either be tolerable or become toxic to children and adolescents. ACEs are traumatic or stressful events that occur in childhood, such as abuse, neglect, domestic violence, and parents with substance dependence or mental illness. Multiple reports have demonstrated that children and young adults have a milder form of the disease compared to adults.[5] Asymptomatic, mild and moderate infections comprise over 90% of all children who have tested positive for COVID-19 with fewer severe and critical cases (5.9%) compared to adults (18.5%).[5] The possible reasons for lower number and milder infections in children and young adults include lower exposure to virions, being isolated at home and minimal exposure to pollution and cigarette smoke contributing to healthier respiratory tracts. The elderly may be susceptible to severe COVID-19 disease by their qualitatively different immune response, encompassed by the terms 'immunosenescence' and 'inflammaging'.[6] Viral co-infection may be important in potentially leading to limited replication of the SARS-CoV-2 by direct virus-to-virus interaction and competition.[7] Additionally, the distribution, maturation and functioning of viral receptors such as ACE2 may be important in age-dependent susceptibility to severe COVID-19.[5,8] Due to smaller number of reported cases in children, it is at present challenging to delineate the clinical characteristics of children with severe COVID-19 infection, combined with the lack of a clear biomarker to indicate severity of infection.[9] Dong, et al,.[5] in the largest pediatric review of 2143 children, described that 13% of virologically confirmed children were asymptomatic. This makes epidemiological inference problematic since asymptomatic children are less likely to be tested and may still contribute to transmission. In addition, a significant proportion of children can also have coinfections with other viruses, and the detection of SARSCoV- 2 may therefore be clinically insignificant.[10] It has been proposed that the outcome for some children may be worse due to exposure to antenatal smoking and obesity.[9] Another theory that has been postulated is the protective role of Bacillus Calmette-Guérin (BCG) vaccine in COVID-19. BCG vaccination has been associated with heterologous immunity to other pathogens, potentially by a phenomenon called 'trained immunity' involving innate cells such as macrophages, monocytes and epithelia.[11] Trials are underway to understand if BCG vaccination may offer protection against COVID-19.

Children of all ages can be infected with COVID-19, with more cases reported in younger children and infants.[5] Acknowledging the possible reporting biases discussed above, there is no age or sex preponderance[5] and the median age of infection is 6.7 years (range newborn to 15 years).[12] The incubation period of COVID-19 in children has been reported as 2 days (range-2 to 10 days).[1] At the time of diagnosis, 13-15% of virologically positive children may be asymptomatic.[5,12] The most common symptoms described at onset in children are fever (50%) and mild cough (38%),[13] Fever is present in about 40% of children.[12] Other clinical features include sore throat, rhinorrhea, sneezing, myalgia, fatigue, diarrhea and vomiting. Children may have more upper respiratory symptoms than lower respiratory symptoms[5], and appear to recover in 1-2 weeks.[14]

The typical radiographic findings from chest CT scans were similar to those of adults but were milder. Patchy ground-glass opacities and consolidations were seen because of the parenchymal destruction in children with proven COVID-19, which all normalized during treatment.[15] There is no particular treatment or vaccine in children so far, and the use of antivirals is still being debated. It has been reported that the following five drugs can be used by weighing the benefits and drawbacks: interferon-alpha, lopinavir/ritonavir, ribavirin, chloroquine diphosphate, and umifenovir.[16] High-dose pulmonary surfactant, nitric oxide inhalation, and high-frequency oscillatory ventilation are the other treatment options for newborns. The role of antibiotics is limited to proven bacterial infections only.[17] The aim of the present study was to examine the clinical, physiological & psychological impact of the COVID-19 on children from 5-11 years of age.

Participants and setting: The study was conducted on 200 children, 5-11 years of age to assess their clinical & physiological health during the pandemic. A total of 200 parents having children aged between 5 and 11 years completed an online survey which included a set of questionnaires to measure the clinical, behavioral and emotional state of their children The Survey was conducted via Google form whose link was sent to personal email IDs of the parents of the children. This protocol was exercised in order to follow strict social distancing protocol and to avoid direct contact. The parents were explained about the objective of the study and were informed that the participation was voluntary, and confidentiality will be maintained. The survey included five sections; first section had a detailed

description of the purpose of the study, along with the informed consent. This section explained the importance and benefits of the survey in the current pandemic, highlighting the voluntary nature of participation and assurance of confidentiality of the collected data. Only after consenting to the study, the participants could access the remaining sections. The successive sections collected responses for demographic details, symptoms of the disease, and the changes in the child's emotional and behavioral pattern during the pandemic. Cross-sectional and longitudinal comparison of overall parameters recorded from the study was done. A descriptive statistic was performed. Data was analyzed to assess the statistical significance. A p value < 0.05 was considered statistically significant.

RESULTS

A total of 200 children aged between 5-11 years completed the study. The mean age was 8.68 years. 92 children in our study had no siblings, 69 had 1 sibling and 39 children had 2 siblings. In our study, the data collected from the online survey showed that 11.5% children were not tested for COVID-19. 33.5% of children were tested positive and 21% children were tested negative. It's important to note here that 40% children in our study were asymptomatic. 26% had low grade fever, 10.5% complained of sore throat, 5% had cough, 5% complained of abdominal pain & diarrhea, 2.5% had nasal congestion and myalgia. However nausea, vomiting and headache in children were not reported. Parents reported changes in their children's emotional state and behaviors during the pandemic. It was found that 48% children were impatient, 48% were anxious, 52% were depressed, 19.5% had nightmares and 35% reported to be angry most of the times. Decreased in diet was reported in 76% children. Irritability, restlessness, anger, anxiety, sadness, worries and being likely to argue with the rest of the family was reported by more than 30% of the parents. Children spent significantly more time using screens, and less time doing physical activity and sleeping. Average screen time daily reported was 5.2 hours. Average hours of sleep on daily basis reported were 7.3 hours.

DISCUSSION

The COVID-19 pandemic has imposed a number of changes on daily routines needed to preserve individual health. In this scenario, one priority challenge is identifying and discussing pandemic-related factors that can negatively affect children's growth and development and impair each child's full potential, in order to develop prevention strategies that enable a healthier and more productive population over both the short and long term. The healthy pregnancy, balanced nutrition, immunity to diseases, restful sleep, a family environment rich in positive stimuli, and a high quality educational system are consider as the fundamentals for optimal child growth and development.[18] All these fundamentals are relevant to the prevention of toxic stress and for the development of strong and lasting neural connections in the child's brain.[19]

Several factors related to the pandemic are recognized as ACEs and negatively interfere in the construction and structuring of the child's brain architecture.[20,21] Restrictive social and economic reconfigurations, the fear of contagion, illness caused by COVID-19, isolated family life, school closures, the lack of support networks for other adults, the loss of loved ones, the difficulty of combining working from home with full-time childcare, financial challenges, increased exposure to pre-existing vulnerabilities (such as domestic violence, drug use, and mental illness in family members) can result in toxic stress, which will increase according to the sum of ACEs.[22] Further, the quality and duration of sleep may be irregular, the level of physical and outdoor activities substantially decreases, and the use of electronic devices such as TVs, cell phones and tablets (screen time) increases. These changes prevent child development from reaching its full potential.[23] An increase in parental stress levels during a pandemic, a factor that directly interferes in children's quality of life.[24] Anxiety, excessive concern with cleanliness, excessive fear of falling ill or losing a loved one, concern for the elderly, increased domestic accidents, mood disorders, anxiety disorder, panic, or obsessive-compulsive disorder, and post-traumatic stress are consequences that children and adolescents may experience, according to research into pandemic situations similar to the current one.[25,26]

Genetic developmental programming is strongly influenced by the environment. In an environment with social restrictions where play and leisure activities are only possible within the home environment; where people wear masks and the learning of facial expressions, communication, and language is restricted; and where demonstrating affection is discouraged by many, there is a tendency towards limitations in the formation of certain areas of the brain, including the social brain, with consequent impairment in the acquisition of cognitive, behavioral, social, and communication skills.[27]

Social isolation taken as a prophylactic measure during pandemics is important, but may have several negative impacts such as anxiety and stress in adults and also in children, since free socialization and relationships are important for well-being, increasing social behaviors and stimulating synaptic connections, favoring the construction of the social brain. Physical activities relevant to adequate physical conditioning, emotional well-being, and growth and development in childhood are also restricted.[28,29]

The effectiveness of school shutdown as a measure to combat the spread of epidemics such as COVID-19 has been discussed in many studies.[30] In a context in which children spend the whole day at home, there are increased lonely periods and moments for child self-care.

Situations such as these are fragile, particularly for children under 13 years of age who care for younger siblings without assistance from adults, which can cause an increased risk of domestic accidents, serious behavioral impacts and developmental disorders, such as selective mutism, speech delay, social interaction deficits, and others.

CONCLUSION

There are scarce data about the impact of epidemics on children's growth and development. Preserving children's well-being during stressful times such as pandemics needs greater attention in the medical literature. Children's health is one of the most important issues in the Sustainable Development Goals and science has shown that genetic predispositions are modified by environmental influences, such as those experienced during a pandemic, and affect learning capacities, adaptive behaviors, lifelong physical and mental health, and adult productivity. The findings emphasized the importance of developing prevention programmers to mitigate the impact of COVID-19 pandemic on children's psychological wellbeing.

REFERENCES

1. Ludvigsson JF. Systematic review of COVID-19 in children show milder cases and a better prognosis than adults. Acta Paediatr, 2020 Mar 23. [Epub ahead of print]https://onlinelibrary.wiley.com/doi/epdf/10.1111/ apa.15270.Accessed on April 08, 2020.
2. Government of Canada: coronavirus disease (COVID-19): symptoms and treatment, 2020. Accessed: May 19, 2020: https://www.canada.ca/en/public-health/services/diseases/2019- novel-coronavirus-infection/symptoms.html.
3. Ralph R, Lew J, Zeng T, et al.: 2019-nCoV (Wuhan virus), a novel Coronavirus: human-tohuman transmission, travel-related cases, and vaccine readiness. J Infect Dev Ctries., 2020; 14: 3-17. 10.3855/jidc.12425
4. Thomson GA: Where are we now with COVID-19? (Epub ahead of print). Int J Clin Pract. 2020, e13497. 10.1111/ijcp.13497
5. Dong Y, Mo X, Hu Y, Qi X, Jiang F, Jiang Z, et al. Epidemiological characteristics of 2143 pediatric patients with 2019 coronavirus disease in China. Pediatrics, 2020 Mar. Available from: https://pediatrics.aappublications. org/content/pediatrics/early/2020/03/16/peds.2020-0702.1.full-text.pdf. Accessed on April 04, 2020. [Epub ahead of print]
6. Murray MA, Chotirmall SH. The impact of immunosenescence on pulmonary disease. Hindawi [Internet], 2015 Jun 24. Available from: http:// downloads.hindawi.com/journals/mi/2015/692546.pdf. Accessed on April 06, 2020.
7. Nickbakhsh S, Mair C, Matthews L, Reeve R, Johnson PCD, Thorburn F, et al. Virus–virus interactions impact the population dynamics of influenza and the common cold. PNAS [Internet], Dec 26, 2019; 116: 27142-50. Available from: https://www.pnas.org/content/pnas/116/52/27142 full.pdf. Accessed on April 04, 2020.
8. Lee PI, Hu YL, Chen PY, Huang YC, Hsueh PR. Are children less susceptible to COVID-19? JMII [Internet], Feb. 25, 2020; S1684-1182(20): 30039-6. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7102573/ pdf/main.pdf. Accessed on April 04, 2020.
9. Sinha IP, Harwood R, Semple MG, Hawcutt DB, Thursfield R, Narayan O, et al. COVID-19 infection in children. Lancet Respir, 2020 Mar 27. Available from: https://www.thelancet.com/action/showPdf?pii=S2213- 2600%2820%2930152-1. Accessed on April 05, 2020. [Epub ahead of print]
10. Cruz A, Zeichner S. COVID-19 in Children: Initial characterization of the pediatric disease. Pediatrics. 2020 Mar. [Epub ahead of print]. Available from: https:// pediatrics.aappublications.org/content/pediatrics/early/ 2020/03/16/peds.2020-0834.1.full-text.pdf. Accessed on April 06, 2020.
11. Covián C, Fernández-Fierro A, Retamal-Díaz A, Díaz FE, Vasquez AE, Lay MK, et al. BCG-induced cross-protection and development of trained immunity: Implication for vaccine design.Front Immunol [Internet], Nov 29, 2019; 10: 2806. Available from: https://www.ncbi.nlm. nih.gov/pmc/articles/PMC6896902/pdf/fimmu-10-02806.pdf. Accessed on April 04, 2020.
12. Lu X, Zhang L, Du H, Zhang J, Li YY, Qu J, et al. SARSCoV- 2 Infection in children. NEJM. 2020 Mar 18. Available from: https://www.nejm.org/doi/pdf/10.1056/ NEJMc2005073?articleTools=true. Accessed on April 05, 2020. [Epub ahead of print]
13. Jiehao C, Jing X, Daojiong L, Lei X, Zhenghai Q, Yuehua Z, et al. A case series of children with 2019 novel coronavirus infection: clinical and epidemiological features. CID. 2020 Feb 28. [Epub ahead of print]. Available from: https://academic.oup.com/cid/advancearticle-pdf/doi/10.1093/cid/ciaa198/32709823/ ciaa198.pdf. Accessed on April 06, 2020
14. Cao Q, Chen Y, Chen C, Chiu C. SARS-CoV-2 Infection in children: Transmission dynamics and clinical charateristics. J Formos Med Assoc, 2020; 119: 670-673.
15. Li W, Cui H, Li K, Fang Y, Li S: Chest computed tomography in children with COVID-19 respiratory infection. Pediatr Radiol, 2020; 50: 796-799. 10.1007/s00247-020-04656-7
16. Wang Y, Zhu LQ: Pharmaceutical care recommendations for antiviral treatments in children with coronavirus disease 2019 (Epub ahead of print). World J Pediatr, 2020. 10.1007/s12519- 020-00353-5

17. Hong H, Wang Y, Chung HT, Chen CJ: Clinical characteristics of novel coronavirus disease 2019 (COVID-19) in newborns, infants and children. Pediatr Neonatol, 2020; 61: 131-132. 10.1016/j.pedneo.2020.03.001
18. Beck AF, Cohen AJ, Colvin JD, Fichtenberg CM, Fleegler EW, Garg A, et al. Perspectives from the Society for Pediatric Research: interventions targeting social needs in pediatric clinical care. Pediatr Res., 2018; 84: 10---21.
19. Garner AS, Forkey H, Szilagyi M. Translating developmental science to address childhood adversity. Acad Pediatr, 2015; 15: 493---502.
20. Teicher MH, Samson JA, Anderson CM, Ohashi K. The effects of childhood maltreatment on brain structure, function and connectivity. Nat Rev Neurosci, 2016; 17: 652---66.
21. Hillis SD, Mercy JA, Saul JR. The enduring impact of violence against children. Psychol Health Med., 2017; 22: 393---405.
22. Garner AS, Shonkoff JP, Committee on Psychosocial Aspects of Child and Family Health, Committee on Early Childhood, Adoption, and Dependent Care, Section on Developmental and Behavioral Pediatrics. Early childhood adversity, toxic stress, and the role of the pediatrician: translating developmental science into lifelong health. Pediatrics, 2012; 129: e224---31.
23. Ordway MR, Sadler LS, Canapari CA, Jeon S, Redeker NS. Sleep, biological stress, and health among toddlers living in socioeconomically disadvantaged homes: a research protocol. Res Nurs Health, 2017; 40: 489---500.
24. Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, et al. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. Int J Environ Res Public Health, 2020; 17: 1729.
25. Sprang G, Silman M. Posttraumatic stress disorder in parents and youth after health-related disasters. Disaster Med Public Health Prep., 2013; 7: 105---10.
26. Cameron JL, Eagleson KL, Fox NA, Hensch TK, Levitt P. Social origins of developmental risk for mental and physical illness. J Neurosci, 2017; 37: 10783---91.
27. Yogman M, Garner A, Hutchinson J, Hirsh-Pasek K, Golinkoff RM, Baum R, et al. The power of play: a pediatric role in enhancing development in young children. Pediatrics, 2018; 142: e20182058
28. Borelli JL, Smiley PA, Rasmussen HF, Gómez A. Is it about me, you, or us? Stress reactivity correlates of discrepancies in we-talk among parents and preadolescent children. J Youth Adolesc, 2016; 45: 1996---2010.
29. Council on Community Pediatrics. Providing care for children and adolescents facing homelessness and housing insecurity.Pediatrics, 2013; 131: 1206---10.
30. Viner RM, Russell SJ, Croker H, Packer J, Ward J, Stansfield C, et al. School closure and management practices during coronavirus outbreaks including COVID-19: a rapid systematic review. Lancet Child Adolesc Health, 2020; 4: 397-404.