BMC Infectious Diseases

RESEARCH Open Access

COVID 19 infection clinical features in pediatric patients in Southwestern Iran: a cross-sectional, multi-center study

Marzieh Jamalidoust[1], Mohsen Jalil[2], Zahra Ashkan[3], Moslem Sharifi[2], Rouhollah Hemmati[3], Anahita Sanaei Dashti[1,4*], Mohammad Rahim Kadivar[1,4], Gholamreza Pouladfar[1,4], Ali Amanati[1,4], Seyeheh Sedigheh Hamzavi[1,4], Sadaf Asaie[1], Maryam Eskandari[1], Nasrin Aliabadi[1] and Mazyar Ziyaeyan[1]

Abstract

With the SARS-CoV-2 pandemic, the impact of recent coronavirus, especially in children, cannot be ignored. In this study, we evaluated the SARS-CoV-2 infection rates and associated features in children less than 18 years of age in "Fars" and "Kohgiluyeh and Boyer Ahmad", provinces, Iran. 5943 children who were suspected cases to SARS-CoV-2 infection were enrolled in this study. Demographic and clinical data of SARS-CoV-2 patients were collected from 16 February 2020 to 20 June 2021. Underlying conditions were considered in this study as well. Among 5943 patients suspected COVID 19 cases, 13.51% were confirmed by real-time PCR assay. The female/male ratio was 1:1.3 with a mean age of 5.71 years. 11.2% of confirmed patients were transferred and admitted in Pediatric ICU. COVID 19 was significantly higher in children with malignancy and diabetes rather than those with other underlying diseases. Children of all ages were susceptible to COVID 19, and there is no significant difference between both sexes. Most of the COVID 19 cases were in 10–18 years old group. Among a number of children with different underlying diseases, children with malignancy had the highest rate of SARS-CoV-2 infection, followed by those with diabetes.

Keywords COVID 19 Disease, Real-time PCR, Children, Symptoms, Underlying Disease

Introduction

Coronaviruses (CoVs) are a large family of viruses that were first discovered in the 1960s. They are the largest group of viruses that cause respiratory and gastrointestinal infections. To date, four genera of coronaviruses (α, β, γ, and δ) have been identified as human coronaviruses, in either α or β genera [1]. SARS-CoV-2 or severe acute respiratory syndrome coronavirus-2 is the 7th family of *coronaviridae* which are capable of causing severe diseases in humans. This is a unique strain of RNA virus that has never been observed in humans. In addition to SARS-CoV-2, SARS and MERS viruses have emerged in Southern China (2002) and Saudi Arabia (2012), respectively, and have spread epidemiologically in the human

*Correspondence:
[1]Clinical Microbiology Research Center, Shiraz University of Medical Sciences, Shiraz, Iran
[2]Emergency Medical Service, Yasouj University of Medical Sciences, Yasouj, Iran
[3]Department of Biology, Faculty of Basic Science, Shahrekord University, Shahrekord, Iran
[4]Departments of Pediatrics, Shiraz University of Medical Sciences, Shiraz, Iran

children with cancer and diabetes than in those with other underlying diseases. Fever, cough, dyspnea and other respiratory symptoms, headache, and myalgia were significantly more common in SARS-CoV-2 positive children rather than negative children.

Acknowledgements
Our thanks go to Professor Alborzi clinical Microbiology Research Center staff for their technical support and assistance. The authors would like to thank Shiraz University of Medical Sciences, Shiraz, Iran and also Center for Development of Clinical Research of Namazi Hospital and Dr. Nasrin Shokrpour for editorial assistance and special thanks to Seyedeh Kowsar Shoja for editing the study as a medical researcher.

Authors' contributions
M.J. and M.Z conceptualized and designed the study, collected the data, drafted and revised the manuscript. Z.A and N.A initially analyzed and interpreted the data. A.SD. critically reviewed and revised the manuscript. MR. K, A.SD, GhR.P, SS.H, A. A, and M. Sh visited and follow up the patients. M.E collected the data and drafted the manuscript. S.A collected the data, initially analyzed and interpreted the data. and all authors approved the final manuscript as submitted and agreed to be accountable for all aspects of the work in ensuring that the questions related to the accuracy or integrity of any parts of the work will be appropriately investigated and resolved.

Funding
The study is financially supported by Shiraz University of Medical Sciences.

Data Availability
The data that support the findings of this study are available on request from the corresponding author.

Declarations

Ethics approval and consent to participate
All participants' legal guardians provided written informed consent. The study was approved by the Research Ethics Committee of Shiraz University of Medical Sciences. The study was in line with the ethical principles and the national norms and standards for conducting Medical Research in Iran with the approval ID IR.SUMS.REC.1401.006 on 2022-04-03.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Received: 2 May 2023 / Accepted: 17 October 2023
Published online: 25 November 2023

References

1. Perlman S. J.J.N.r.m. Netland. Coronaviruses post-SARS: Update on Replication and Pathogenesis. 2009;7(6):439–50.
2. Jiehao C et al. *A case series of children with 2019 novel coronavirus Infection: clinical and epidemiological features*. 2020. 71(6): p. 1547–51.
3. Mortaz E et al. *The immune response and immunopathology of COVID-19* 2020. 11.
4. Nasiri M et al. *The probable association between blood groups and prognosis of COVID-19*. 2021. 50(4): p. 825.
5. Xing YJI, Infection. *Prolonged viral shedding in feces of pediatric patients with coronavirus Disease 2019*, J Microbiol. 2020. 25.
6. Zare-Zardini H et al. *Coronavirus disease 2019 (COVID-19) in children: prevalence, diagnosis, clinical symptoms, and treatment* 2020. 13: p. 477.
7. Soltani A et al. *First molecular-based detection of SARS-CoV-2 virus in the field-collected houseflies*. 2021. 11(1): p. 1–7.
8. Dong Y et al. *Epidemiology of COVID-19 among children in China* 2020. 145(6).
9. Shahid S et al. *Clinical Features and Outcome of COVID-19 positive children from a tertiary healthcare Hospital in Karachi* 2021.
10. Jin J-M et al. *Higher severity and mortality in male patients with COVID-19 independent of age and susceptibility* 2020.
11. Bunyavanich S, Do A, Vicencio AJJ. *Nasal gene expression of angiotensin-converting enzyme 2 in children and adults*. 2020. 323(23): p. 2427–9.
12. Isaacs D, et al. Epidemiol Coronavirus Respiratory Infections. 1983;58(7):500–3.
13. Trzonkowski P et al. *Association between cytomegalovirus Infection, enhanced proinflammatory response and low level of anti-hemagglutinins during the anti-influenza vaccination—an impact of immunosenescence*. 2003. 21(25–26): p. 3826–36.
14. Ghaffari HR et al. *Detection of SARS-CoV-2 in the indoor air of intensive care unit (ICU) for severe COVID-19 patients and its surroundings: considering the role of environmental conditions*. 2021: p. 1–7.
15. Zimmermann P. and N.J.A.o.d.i.c. Curtis, *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*. 2021. 106(5): p. 429–39.
16. Baki AA et al. *COVID-19 in Egyptian Children: A Multicenter Study* 2021. 16(02): p. 057–061.
17. Covid C et al. *Severe outcomes among patients with coronavirus Disease 2019 (COVID-19)—United States, February 12–March 16, 2020*. 2020. 69(12): p. 343.
18. Shahbaznejad L et al. *Clinical characteristics and outcomes of COVID-19 in children in northern Iran* 2021. 2021.
19. Zhang C et al. *Clinical and epidemiological characteristics of pediatric SARS-CoV-2 Infections in China: a multicenter case series*. 2020. 17(6): p. e1003130.
20. Jamalidoust M et al. *Prevalence and clinical presentation of COVID 19 in health care workers in two main hospitals during the pandemic in Shiraz*, Iran 2022. 10(4).
21. Hoang A et al. *COVID-19 in 7780 pediatric patients: a systematic review* 2020. 24: p. 100433.
22. Jalil M et al. *Effect of COVID-19 on healthcare workers' morbidity and mortality compared to the general population in Kohgiluyeh and Boyer- Ahmad Province, Iran* 2023. 6(1): p. e961.
23. Parri N, Lenge M, D.J.N.E.J.o M, Buonsenso. Child Covid-19 Pediatr Emerg Departments Italy. 2020;383(2):187–90.
24. Gholami A et al. *The prevalence of clinical symptoms in children and adolescents with Covid-19: a systematic review and Meta-analysis study*. 2020. 8(10): p. 12177–88.
25. Akobeng AK et al. *Gastrointestinal manifestations of COVID-19 in children: a systematic review and meta-analysis*. 2021. 12(4): p. 332–7.
26. Götzinger F et al. *COVID-19 in children and adolescents in Europe: a multinational, multicentre cohort study* 2020. 4(9): p. 653–661.
27. Chao JY et al. *Clinical characteristics and outcomes of hospitalized and critically ill children and adolescents with coronavirus Disease 2019 at a tertiary care medical center in New York City*. 2020. 223: p. 14–9. e2.
28. Tagarro A, et al. Screening and severity of coronavirus Disease 2019 (COVID-19) in children in Madrid. Spain. 2021;175(3):316–7.
29. Panahi L, Amiri M. and S.J.A.o.a.e.m. Pouy, *clinical characteristics of COVID-19 Infection in newborns and pediatrics: a systematic review*. 2020. 8(1).
30. Amanati A et al. *Severe acute respiratory syndrome coronavirus-2 Alpha variant (B. 1.1. 7), original wild-type severe acute respiratory syndrome coronavirus 2, and cytomegalovirus co-infection in a young adult with acute lymphoblastic leukemia, case report, and review of the possible cytomegalovirus reactivation mechanisms* 2023. 17(1): p. 1–12.
31. Covid C et al. *Coronavirus Disease 2019 in children—United States, February 12–april 2, 2020*. 2020. 69(14): p. 422.
32. Kompaniyets L et al. *Underlying medical conditions associated with severe COVID-19 Illness among children*. 2021. 4(6): p. e2111182–2.
33. Jamalidoust M et al. *Comparing clinical presentation, viremia, and immunological factors at various severity presentations in hospitalized children affected by COVID-19: a cross- sectional study*. 2023. 6(5): p. e1259.
34. Ogimi C et al. *Characteristics and outcomes of coronavirus Infection in children: the role of viral factors and an immunocompromised state*. 2019. 8(1): p. 21–8.
35. Aliabadi N et al. *Seroprevalence of Anti-SARS-CoV-2 antibodies in high-risk occupational and low-risk groups in Southwestern Iran*. 2022. 15(7).
36. Rezaei Z et al. *SARS-CoV- 2 variants circulating in the Fars province, southern Iran, December 2020–March 2021: A cross- sectional study* 2023. 6(6).
37. Qiu H et al. *Clinical and epidemiological features of 36 children with coronavirus Disease 2019 (COVID-19) in Zhejiang, China: an observational cohort study*. 2020. 20(6): p. 689–96.
38. Ludvigsson JFJAp. *Systematic review of COVID-19 in children shows milder cases and a better prognosis than adults*. 2020. 109(6): p. 1088–95.