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Severe Acute Respiratory Syndrome Coronavirus-2 (SARS-Cov-2) A Symptomatic Infection in Pediatric Population: A Literature Review

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ABSTRACT

Introduction: *Severe Acute Respiratory Syndrome Coronavirus-2* (SARS-Cov-2) is a zoonotic pathogen that causes COVID-19 disease. This disease manifests with nonspecific symptoms similar to flu, the most common clinical complication is acute respiratory distress, which is the main cause of death. SARS-Cov-2 rarely causes severe illness in children. The database obtained comes from the Centers for Disease Control and Prevention, SARS-Cov-2 only occurs in 1.7% of people younger than 4 years and 7.7% of those aged 5 to 17 years. **Objective:** This article aims to review the basic issues regarding asymptomatic SARS-Cov-2 infection in children.**Method:**The search was carried out using databases from Google Scholar and Pubmed. The included articles were articles published from 2020 to 2021. The keywords and terms used for the article search are as follows: “SARS-Cov-2”, “SARS-Cov-2 Asymptomatic Infection”, “SARS-Cov-2 Asymptomatic Infection in Pediatric”. **Results:** There were 13 articles that discussed things related to asymptomatic SARS-Cov-2 infection in children.**Conclusion:** All age groups of children are susceptible to infection with SARS-CoV-2. Infection in children usually has milder clinical signs and symptoms than in adults and is usually asymptomatic.

Keywords:SARS-Cov-2 asymptomatic infection, Pediatric.

INTRODUCTION

SevereAcuteRespiratorySyndromeCoronavirus-2(SARS-Cov-2)is a zoonotic pathogen that causes COVID-19 disease. This disease manifests with nonspecific symptoms similar to flu, the most common clinical complication is acute respiratory distress, which is the main cause of death.[1]SARS-Cov-2 rarely causes severe illness in children, the severity of SARS-Cov-2 infection is more common in adults.[2,3]The database obtained comes from the Centers for Disease

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Control and Prevention, SARS-Cov-2 occurred in only 1.7% of people younger than 4 years and 7.7% of those aged 5 to 17 years.[4] Patients who require medical care may have comorbid conditions that can affect their SARS-Cov-2 infection.[5] The asymptomatic group reported an increase of 0.6% to 13.7%. 6–10 Most of these studies included adults only. Three studies examining asymptomatic pediatric surgical oncological patients through Polymerase Chain Reaction (PCR) reported positive results for SARS-Cov-2, namely 0.6% to 2.5%. [6-8] In addition a research involving 33.041 children tested in various hospitals in the United States showed asymptomatic results with a prevalence of 0.7%.[11] Although children are classified as more benign or remain asymptomatic when compared to adults, they have the potential to carry the virus and become a source of infection.[12]

SARS-Cov-2 is present in high concentrations in the oral cavity and pharynx.[13] In addition, procedures in dentistry can produce aerosols that increase the risk of transmission.[14] Thus, dental and oral health care providers are at high risk of infection if they handle SARS-Cov positive patients. -2. The Center for Disease Control (CDC) and the American Dental Association (ADA) have developed infection control guidelines in dental practice during the COVID-19 pandemic.[15] These include screening each patient for signs and symptoms of COVID-19, use of universal personal protective equipment and sources of control strategies such as wearing face masks at all times, hand hygiene and implementing technical approaches to reduce disease transmission. The CDC recommends asymptomatic SARS-Cov-2 testing for dental patients undergoing dental and oral health care as a way to identify operators and reduce risks in dental and oral health care facilities. This new strategy, however, has not been used universally. Identification of patients with SARS-Cov-2 is important in infection control strategies and reduces the risk of infection in oral health care.

METHOD

Search Strategy

The search was carried out using online databases from Google Scholar and Pubmed. The included articles were articles published from 2020 to 2021. The keywords and terms used for the article search are as follows: “SARS-Cov-2”, “SARS-Cov-2 Asymptomatic Infection”, “SARS-Cov-2 Asymptomatic Infection in Pediatric ”. In each article found according to keywords, the title and abstract of each article were checked and articles that met the criteria were downloaded.

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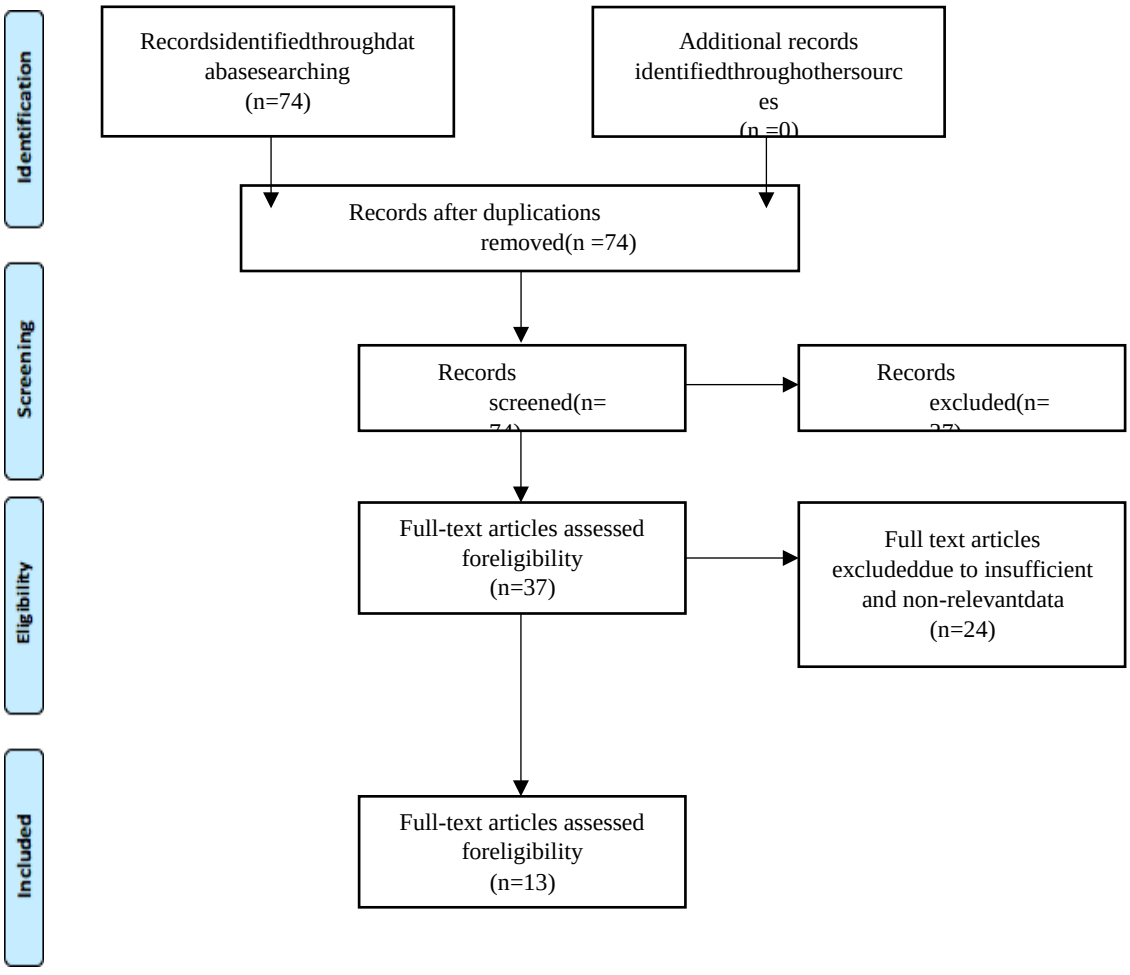
The flow chart in figure 1 identifies the articles included and excluded at each stage. A total of 74 articles were found using the above keywords, after removing duplicates, 74 articles were found. A total of 74 articles were screened, and 61 articles were excluded, 13 full-text articles were examined for their eligibility and 13 full-text articles were included as articles to be reviewed.

Inclusion and Exclusion Criteria

1. Inclusion Criteria
   a. Articles published in the last 2 years (2020-2021)
   b. Articles in English
   c. Articles that focus on the definition, prevalence, classification, etiology, signs and symptoms, effects, and management of asymptomatic SARS-Cov-2 infection in children.
2. Exclusion Criteria
   a. Articles that only have abstracts written in English
   b. Full-text articles unavailable for open access
   c. The article does not focus on asymptomatic SARS-Cov-2 infection in children, only touches slightly on asymptomatic SARS-Cov-2 infection in children.

Figure1.PRISMAflowchartofthesystemicliteraturereviewandarticleidentificationprocess.



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RESULTS

Of the articles found, 13 were analyzed and included in this systematic review. Information regarding the article can be found in table 1.

No.	Writer	Year	Title	Conclusion
1.	Alsohime F, TemsahM, Al-Nemri AM,Somily AM, Al-Subaie S.[16]	2020	COVID-19 infectionprevalence inpediatricpopulation:Etiology, clinicalpresentation, adnoutcome.	Currently, the COVID-19 pandemic is developing rapidly. As of April 14, 2020, cases reported in the literature showed that, most of the pediatric COVID-19 patients have a good prognosis, and in mild cases, recovery takes 7 to 14 days after onset. 17 In an extensive analysis of 72,314 cases in China, there were 549 cases of single death, in the 10–19-year age group.18 In Spain, 60% of COVID-19 infections occured in children, 10% were admitted to pediatric intensive care units.19 In the United States, 5.7% - 20 % of children were hospitalized with a percentage of 0.58% - 2% needing care in the pediatric intensive care unit.[20]
2.	Kronbichler A,Kresse D, Yoon S,LeeKH,EffenbergerM,ShinJI.	2020	Asymptomaticpatients as a sourceofCOVID-19 infections:Asystematic reviewandmeta-analysis.	More than half of the asymptomatic patients presented with abnormalities on CT scans. Asymptomatic patients are contagious and a potential source of infection. In this systematic review and meta-analysis, it can be proved that a CT scan is not necessary for young patients who present asymptomatically because most of them will not show any relevant abnormalities. In this analysis it was also found that asymptomatic cases can cause more than 20% of the total COVID-19 patients

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3.	Yoon S, Li H, LeeKH,HongSH,Ki mD,ImH, Rah W, Kim E, Cha S, YangJ, Kronbicher A,Kresse D, KoyanagiA, Jacob L, GhaydaRA, Shin JI, Smith$_{L.}$[21]	2020	Clinicalcharacterist ic ofasymptomatic andsymptomaticpe diatriccoronavirus disease2019(COVI D-19): A systematicre view.	CT scan results of children suffering from COVID-19 did not show any relevant results compared to clinical findings, nor was there a significant difference in clinical findings between asymptomatic and symptomatic children. Further studies evaluating COVID-19 in pediatrics could contribute to potential therapeutic interventions and prevention strategies to limit its spread.
4.	Consiglio CR,Nicola C, Sardh F,Landegren N, PalmaP,Brodin P.[22]	2020	The Immunologyof MultisystemInfla mmatorySyndro me inChildren withCOVID-19.	Immune system, blood, cytokines and autoantibodies in healthy children, children with a history of Kawasaki disease, children infected with SARS-CoV-2 and children presenting with MIS-C. It was found that the inflammatory response in MIS-C is different from that of the cytokines in severe acute COVID-19.
5.	Cui X, Zhao Z,Zhang T, GuoW,Guo W, Zheng J,Zhang J, Dong C,Na R, Zheng L, LiW,Li Z, MaJ, WangJ,HeS,XuY,Si P,ShenY,Cai$_{C.}$[23]	2021	A systematicreview and meta-analysis of childrenwith coronavirusdisease 2019(COVID-19).	The COVID-19 pandemic can strike all age groups of children with milder symptoms. Pediatric patients suspected of having COVID-19 have non-specific signs and symptoms, which can include fever and cough. Pediatric patients with COVID-19 may experience milder signs and symptoms compared to atypical clinical manifestations and rare lymphopenia. The high incidence of vomiting and symptoms of vomiting gives more attention to children under 1 year of age. The characteristics of COVID-19 in children and adults are different, therefore further research is needed.

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6.	Ho CLT, Oligbu P,Ojubolamo O,Pervaiz M, Oligbu G.[24]	2020	Clinicalcharacteristics ofchildren withCOVID-19.	The data currently available suggests that children who catch COVID-19 are more likely to experience milder symptoms than adults. This study identifies the international standard of COVID-19 cases in children in order to better understand the development and possible complications associated with this virus. In addition, given the absence of adequate treatment, prospective randomized controlled trials would be useful to provide strong evidence for the development of treatment strategies, hopefully reducing morbidity in children.
7.	De LucaCD,Esposito E, CristianiL, Mancino E,Nenna R, Cortis E,Midulla F.[25]	2020	Covid-19 inchildren: A briefoverview afterthree monthsexperience.	COVID-19 shows a milder clinical history in children than in adults. A much lower percentage of children suffering from severe or critical illness and death is an exception. Children may present with non-specific viral infection symptoms which demonstrate the importance of accurate differential diagnosis with typical pediatric clinical conditions such as upper respiratory tract infections, fever of unknown cause, viral or bacterial pneumonia, bronchiolitis, gastroenteritis and asthma attacks.[26] Same as in adults, in children cardiovascular disease also appears to be the comorbid disease that most often causes the severity of COVID-19.

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8.	Ludvigsson,JF.[27]	2020	Children areunlikely to be themain drivers of theCOVID-19 pandemic–asystematicreview.	The conclusion of this systematic review is that children are unlikely to be the main drivers of the pandemic. Opening schools and kindergartens is unlikely to affect the death rate for COVID-19in parents.
9.	Rabinowicz S,Leshem A, PessachIM.[28]	2020	COVID-19 in thePediatricPopulation –Review and currentevidence.	Children in any age group can be infected with SARS-CoV-2, with a lower frequency and severity than adults, although further epidemiological data are needed. Data on antiviral care, vaccination safety and immunogenicity and better specification of high-risk patients in the pediatric population are also needed. As the pandemic continues to evolve, it is still difficult to assess the long-term effects that significant changes will have on society, the economy and human behavior on the health and well-being of children in the future.
10	Ciuca IM.[29]	2020	COVID-19in children: An amplereview.	The study emphasizes that although COVID-19 is rare in children, asymptomatic SARS-CoV-2 infection is more common in children than in adults. Collecting high-quality evidence is important to better understand COVID-19 in children, as well as a way to determine the most efficient case management strategy.

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11	PagliaL.[30]	2020	COVID-19and Pediatric Dentistryafterlock down	A common clinical observation is that COVID-19 is less severe in children, and in this group infection usually occurs asymptomatically. Further clinical studies can clarify infection and transmission dynamics; therefore, it is important to apply to children all the preventive measures not hygiene measures recommended by health authorities during dental care. Dentists should avoid aerosol-generating procedures as much as possible, minimizing the use of syringes. If possible, it is recommended to use minimally invasive procedures and atraumatic restorative treatment.
12	SerranoCO,Alonso E, Andres M,Buitrago NM,Vigara AP, PajaresMP,LopezA C,MollGG,EspinIM , BarriocanalMB.[31]	2020	Pediatric chest x-ray incovid-19infection.	This study proves that children with symptomatic COVID-19 symptoms show abnormalities in CXR results. The findings are not specific and therefore the CXR cannot be used as the main diagnostic tool. However, radiographs should be considered for use in these patients.

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13	Badal S, BajgainKT, Badal S, ThapaR, Bajgain BB,Santana MJ.[32]	2020	Prevalence, clinicalcharacteristics, andoutcomes ofpediatric COVID-19: A systematicreview and meta-analysis	This study shows that all age groups of children are susceptible to infection with COVID-19, usually having mild clinical signs and symptoms. Critical circumstances or death are very rare. Cough fever and headache are the most common symptoms, whereas laboratory or radiological results do not show consistency, making it impossible to determine a diagnosis. Overall, the prognosis for COVID-19 in the pediatric age group is good. However, the differences in the characteristics of clinical findings in children suspected of having COVID-19 have implications for uncontrolled transmission and control of viral infection. Therefore, proper guidelines for testing and quarantine in children are needed. Effective strategies to ensure the prevention and maintenance of contacts are highly recommended for proper management of children during the time of this pandemic.

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DISCUSSION

The rapid and continuous spread of SARS-CoV-2 infection indirectly forces practitioners and health care providers to have a clear picture of the mode of transmission and clinical characteristics of the infection. The pediatric population has recently been examined by various systematic reviews, [33–35] this is done in order to find out more about the clinical characteristics of infection in children and to evaluate the extent to which children with asymptomatic infections can act as carriers of symptomatic disease that are mild, despite mild symptoms, SARS-CoV-2 infection can still be transmitted rapidly during the incubation period.

Diagnostic markers are more accurate in determining symptom onset in the population of children under 10 years of age. In this group, abnormal laboratory characteristics, in particular high lymphocyte levels, were associated with symptomatic infections, and radiographic findings that were abnormal, low white blood cell count, low neutrophil count and low creatinine level.[36,37,38] Previous studies have shown that pediatric patients both boys and girls have the same likelihood of becoming infected, but children who are male sex are more likely to experience asymptomatic infections.

All age groups of children are susceptible to infection with COVID-19. Acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection in children is usually very mild and asymptomatic. Critical circumstances or death are very rare. The data currently available suggests that children who catch COVID-19 are more likely to experience milder symptoms than adults. Cough fever and headache are the most common symptoms, while laboratory or radiological results are not consistent, so it is not easy to determine the diagnosis. Overall, the prognosis for COVID-19 in the pediatric age group is good. However, the differences in the characteristics of clinical findings in children suspected of having COVID-19 have implications for uncontrolled transmission and control of viral infection.

Most of the patients with asymptomatic symptoms show normal laboratory results. The predominant laboratory findings were leukopenia, lymphopenia, LDH and elevated CRP. Existing studies of symptomatic patients showed laboratory findings with leukocytosis rather than leukopenia,[39,40] whereas CT scan results of 135 asymptomatic patients showed abnormal results. Asymptomatic patients especially in children showed significantly normal CT scan results. Several studies have objected to the use of CT scanning in patients in the age group under 20 years with normal chest radiographs.[41,42,43,44,45,46] CT scans need not be performed on young patients who present asymptomatically because most of them will not show any relevant abnormalities. CT scan results in children suffering from COVID-19 did not show

any relevant results compared to clinical findings, nor was there a significant difference in clinical findings between asymptomatic and symptomatic children.

CONCLUSION

All age groups of children are susceptible to infection with SARS-CoV-2. Infection in children usually has milder clinical signs and symptoms than in adults and is usually asymptomatic. Critical circumstances or death are very rare. Overall, the prognosis for COVID-19 in the pediatric age group is good. However, the differences in the characteristics of clinical findings in children suspected of having COVID-19 have implications for uncontrolled transmission and control of viral infection. Therefore, proper guidelines for testing and quarantine in children are needed. Effective strategies to ensure the prevention and maintenance of contact are highly recommended for the proper management of children in this time of the pandemic.

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