What is the prevalence of asymptomatic pediatric patients with COVID19?

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This rapid review summarizes the available evidence on the prevalence of asymptomatic pediatric patients with COVID-19 infection

KEY FINDINGS

The pooled estimate of prevalence of SARS-CoV-2 infected children who do not present with any symptoms at the time of testing is 21% (95% CI, 19%-23%).

- COVID-19 cases in children may be under reported since testing in the absence of symptoms is not routinely done.
- Familial transmission was found in 90% (95% CI, 88%-92%) of COVID-19 PCR-tested pediatric patients regardless of presentation
- Compared to adults, children with COVID-19 present with milder disease course. The prevalence of children not showing any symptoms at the time of testing is 21% and is estimated from a pool of sixteen studies.
- Some reports of COVID-19 transmission from asymptomatic adult individuals are available but are not sufficient in showing its impact on local transmission. Data in children are not available.

RESULTS

A total of sixteen studies were included in this review. Ten were single-center case series done in different regions in China [6,17-25]. four studies were multi-center case series [26-29] while two were national reports- one from China and one was the US [8,30].

Majority of pediatric patients included in the studies were tested as part of contact tracing. Familial transmission is considered the most common mode of infection among children [6, 19, 20, 22,26, 28]. Of our sixteen studies, eleven reported on the prevalence of familial exposure. Pooled estimates from these studies showed 90% (95% CI 88-92%) of infection came from a family member. However, to document whether asymptomatic children can transmit the virus, follow up of their family members is required.

Prevalence of asymptomatic children with COVID-19

Based on the sixteen included studies, pooled proportion of prevalence of children presenting with no symptoms at the time of testing that are infected with the SARS-COV-2 virus is 21% (95% CI, 19%-23%).

Unfortunately, the studies included did not report long term follow-up of the patients, although information gathered from the included studies indicated that the children remained asymptomatic until discharge or until they had a negative PCR test result. Some studies however have showed that despite remaining asymptomatic, some patients presented with CT scan findings consistent with lung injuries [20,28]. This could indicate that despite the absence of signs and symptoms, patients may still have the ability to transmit the disease.

Recommendations from Other Guidelines

Current evidence suggest that children with COVID-19 play a minor role in disease transmission whether they present with symptoms or not [32,33]. Children most often have adult contacts which developed COVID-19 related symptoms first, whereas adults living with children with COVID-19 rarely develop symptoms suggesting that children have low ability to transmit the disease [33]. There is still limited data on the prevalence of asymptomatic infection among the pediatric (and general) population. This has been recognized by the CDC as one of the critical gaps in our current knowledge of the disease including the protective immunity conferred by asymptomatic infection, and the public health interventions aimed at preventing asymptomatic transmission [16].

CONCLUSION

Based on current available evidence, the prevalence of asymptomatic COVID-19 pediatric population at the time of testing is 21% (95% CI, 19%-23%), but this report may still not reflect the true prevalence, as testing of asymptomatic patients is not routinely done.

Declaration of Conflict of Interest

No conflict of interest

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Appendix 1. Characteristics of included studies

No.	Title/Author	Study design	Country	Outcomes	Key findings
1	Clinical and CT features in pediatric patients with COVID-19 infection: Different points from adults Xia, W	Case series	China	13 of 20 patients had familial transmission 2/20 were asymptomatic	COVID-19 pneumonia in children presents usually with mild symptoms and chest CT changes characteristic of COVID-19 may be used as a guide to manage patients as COVID-19 cases even if swab results are negative. CT findings alone however is not enough to diagnose COVID-19 so continued follow-up and observation is still important. [22]
2	Clinical Analysis of 25 Novel Coronavirus Infections in Children. Bai, K	Case series	Chongqing, China	25/25 children had family cluster , 7 with travel history or lives in Hubei, China. 8/25 (32% asymptomatic), 4 (15%) mild, 13 (52%) common cases	There is lower severity of disease among pediatric population as compared to adults, with the clinical manifestation and laboratory markers more non specific. Nucleic acid testing is the standard for diagnosis especially among asymptomatic patients [29]
3	COVID-19 in Children, Pregnancy and Neonates: A Review of Epidemiologic and Clinical Features. Zimmerman, P	review of case series	multiple, majority from china	total of 333 infants and children, 85% had positive contact history mostly with family members, 35% asymptomatic	Most children had contact with a family member that has the infection. Co-infections with other viruses in children is common with an incidence of up to 79% Four neonates became positive for SARS COV-2 despite strict infection control and separation of mother and neonate after delivering raising possibility of vertical transmission [26]
4	Clinical features of children with SARS-CoV-2 infection: an analysis of 13 cases from Changsha, China]. Tan, X	case series	Changsa, China	2/13 patients had no symptoms children were followed up for two weeks, all were normal median time of clearance of virus was 13 days, 3 presented with false negative on initial testing	transmission route of SARS COV 2 infection in children is among family members. There is possibility of fecal-oral transmission. Multiple nucleic acid based test performed for patients with sars-cov2 infection and their close contacts by multiple site sampling, and follow-up to observe long-term prognosis [17]

5	Covid-19 lessons to date from china Lu, Xiaxia	review of case series	China	pediatric series of three studies/cites Qui et al: n=36, Zheijang province, median age 3.5-15 yrs, household contact with confirmed or suspected cases = 32 (89%), travel exposure = 12 (33%), asymptomatic 10 (27.7) lu et al: n =171 (Wuhan, China), median age range 6.7-15 years, household contact with contact to suspected cases 154 (90.1%), contact with other suspected/confirmed case 2 (1.2%), unidentified source of infection 15 (8.8%), asymptomatic 27 (15.8%) CDC COVID response team n =2572, median age range 11-17, household contact 168/184 (91.3%), travel exposure 16/184 (8.7%), asymptomatic no data	early detection of infected patients, and timely isolation of cases who have definitive contact history is very important to control the outbreak, a low threshold of testing and upscale of testing capability are likely to be keys for success in controlling the outbreak [27]
6	Clinical characteristics and radiological features of children infected with the 2019 novel coronavirus Lu, Y	case series	China, Guangzhou	n = 9, mean age 7.8 years old, 1patient (11.1%) was an asymptomatic carrier with no abnormality seen in CXR and CT scan, all children had history of close contact with confirmed or suspected 2019 no-infected patients	clinical characteristics lack a typical pattern. Suspected covid19 infected children with close contact, symptoms, or chest CT features should not be missed [19]
7	Epidemiological and clinical characteristics of novel coronavirus infection in children: Thoughts on the diagnostic criteria of suspected cases outside Hubei Province Jiang, J	Case series	China, Wanzhou	3 of 6 patients were asymptomatic	Among the presentation of the patients, only 1 met the diagnostic criteria for early suspected case showing the need to modify the criteria used in this study [23]

8	Clinical features of pediatric patients with coronavirus disease (COVID-19). Song, W	case series	China, Hubei province	n = 16 age range 11.5months - 14 years. 12 (75%) with disease family clustering (2 or more infected confirmed family members), 2 had other contact, 1 with history of travel to Wuhan. 8 (50%) asymptomatic, 4 of these had CT findings showing signs of pneumonia, while 4 had normal chest CT	COVID-19 in children is generally family acquired and often not serious, with a good prognosis. Asymptomatic children can be diagnosed as pneumonia because of chest CT abnormalities. We must be attentive to the many children who are asymptomatic carriers to prevent and control this pandemic [20]
9	Clinical features of children with SARS-CoV-2 infection: an analysis of 115 cases Ma, Y	case series	China, Wuhan	n = 115, 105 (91.3%) close contact with individuals with SARS COV 2 infection, 61 (53% were asymptomatic)	most children with SARS COV 2 infection have a close contact history. There is a high proportion of asymptomatic infection among children [6]
10	Clinical characteristics of COVID-19 in children compared with adults in Shandong Province, China. Du, W	case series	China, Shandong Province	n = 14 children, rang 0-16 yrs median 6.2yrs, all cases were family clusters, 8 asymptomatic cases (57.1%) with 5 (62.5%) having CT findings of lung injuries	there is substantial lung injuries even among asymptomatic children, but there is less clinical disease, perhaps because of a lower pronounced inflammatory response, and that the occurrence of this pattern appears to inversely correlate with age [28]
11	Epidemiologic and clinical characteristics of 10 children with coronavirus disease 2019 in Changsha, China. Tan, Y	case series	China, Changsha	n = 10, range 1-12 years (median 7), all had close contact with adults diagnosed with COVID-19, 2 asymptomatic (20%) both with normal CT findings	intrafamily transmission may be the main form of transmission of COVID-19 in children, and persistent intestinal excretion of virus is another characteristic among children. [18]
12	Chest computed tomography in children with COVID-19 respiratory infection Li, W	Case series	China, Zhuhai Guadong province	n = 4/5 asymptomatic	children present with less lung abnormality by chest CT as compared to adults. Asymptomatic children with COVID-19 may have modest lung abnormality but remain asymptomatic [25]
13	Coronavirus Disease 2019 in Children — United States, February 12–April 2, 2020 CDC COVID -19 Response Team	Retrospective analysis	USA	2572 COVID-19 cases in children < 18 years old with median age of 11 data on signs and symptoms available only for 291 of cases, 78 no fever, cough or shortness of breath, however 53 of these (68%) could not be labeled completely as asymptomatic because	persons with asymptomatic and mild disease, including children, are likely playing a role in transmission and spread of COVID-19 in the community, social distancing and everyday preventive behaviors are recommended for persons of all ages to slow the spread of the virus, protect the health care system from being overloaded, and protect older adults and persons of any age with serious underlying medical condition [30]

				of incomplete symptom information	
14	Epidemiological Characteristics of 2143 Pediatric Patients with 2019 Coronavirus Disease in China Dong, Y	case series	China	n = 731 laboratory confirmed cases, age 2-13 (median age 7), 94 (4.4%) asymptomatic	Children of all ages are susceptible to COVID-19. Presentation is less severe [8]
15	A Case Series of Children With 2019 Novel Coronavirus Infection: Clinical and Epidemiological Features Jiehao, C	Case series	China, Zhandong Province	10 children admitted to Children's hospital in different areas in Shangdong province with PCR confirmed COVID-19 all children had symptoms	COVID-19 in children presents with mild symptoms. Epidemiological exposure is a very important clue to detect pediatric cases. [21]
16	Analysis of CT Features of 15 Children with 2019 Novel Coronavirus Infection Feng, K	Case series	Chia, Shenzhen	15 children admitted to the third people's Hospital of Shenzhen from January 16 to February 6, 2020 confirmed to have COVID-19 of the 15, 10 were asymptomatic	The clinical symptoms of children with 2019-nCoV infection are nonspecific. [24]