

EVIDENCE SEARCH REPORT

RESEARCH QUESTION:	What is the disease progression and epidemiology of COVID-19 in pediatric populations?	Unique Identifier:	EOC072102-01 ESR
RESOURCES USED:			
<ul style="list-style-type: none"> • Embase • European Centre for Disease Prevention and Control • Google Scholar • Google advanced search • LitCovid • McMaster COVID-19 Evidence Alerts • MEDLINE • MedRxiv • PubMed • Penta Child Health Research • WHO Global Research on COVID-19 			
LIMITS/EXCLUSIONS/INCLUSIONS:		English	REFERENCE INTERVIEW COMPLETED: July 23, 2020
DATE:		July 31, 2020	
LIBRARIAN:		REQUESTOR:	
Michelle Dalidowicz Brianna Howell-Spooner Courtney Ellsworth		Dr. Nazeem Muhajarine	
TEAM: EOC			
SEARCH ALERTS CREATED: N/A			
CITE AS: Dalidowicz, M; Howell-Spooner, B; Ellsworth, C. What is the disease progression and epidemiology of COVID-19 in pediatric populations? 2020 Jul 31; Document no.: EOC072102-01 ESR. In: COVID-19 Rapid Evidence Reviews [Internet]. SK: SK COVID Evidence Support Team, c2020. 44 p. (CEST evidence search report)			

LIBRARIAN NOTES/COMMENTS

Hello Dr. Muhajarine,

We have searched our resources and have included the relevant results. If you would like this search to continue or if you have any questions or concerns, please let us know and we will assist you.

Thank you,

Michelle Dalidowicz, Brianna Howell-Spooner, & Courtney Ellsworth

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SEARCH RESULTS

To obtain full-text articles email library@saskhealthauthority.ca.

SUMMARIES, GUIDELINES & OTHER RESOURCES

Point of Care Tools

DynaMed. COVID-19 and Pediatric Patients. 2020, July 20. <https://www.dynamed.com/condition/covid-19-and-pediatric-patients/>

UpToDate

Coronavirus Disease 2019 (COVID-19): Clinical Manifestations and Diagnosis in Children. 2020, July 21. https://www.uptodate.com/contents/coronavirus-disease-2019-covid-19-clinical-manifestations-and-diagnosis-in-children?topicRef=128190&source=related_link

Coronavirus Disease 2019 (COVID-19): Multisystem Inflammatory Syndrome in Children. 2020, July 16. <https://www.uptodate.com/contents/coronavirus-disease-2019-covid-19-multisystem-inflammatory-syndrome-in-children>

Evidence Summary

Boast A, Munro A, Goldstein H. An evidence summary of Paediatric COVID-19 literature, Don't Forget the Bubbles, 2020. Available at: <http://doi.org/10.31440/DFTB.24063>

Canada

Public Health Ontario. COVID-19 – What We Know So Far About . . . Infection in Children. 2020, May 15. <https://www.publichealthontario.ca/-/media/documents/ncov/what-we-know-children-feb-21-2020.pdf?la=en>

Nova Scotia IWK Health Centre Spectrum App. Disease Progression, Predictive Features, Pediatrics, Pregnancy. 2020. <https://app.spectrum.md/en/clients/7-iwk-health-centre/steps/38145>

- **Librarian's Note:** Pediatrics section, click on the word "Pediatrics" to open

Europe

European Center for Disease Prevention and Control. Epidemiology of COVID-19. 2020, June 30. <https://www.ecdc.europa.eu/en/covid-19/latest-evidence/epidemiology>

Librarian's Note: First section on the disease in children.

Germany

COVID Reference. Pediatrics. <https://covidreference.com/pediatrics>

Sweden

Covid-19 in Schoolchildren: A Comparison Between Finland and Sweden. Public Health Agency of Sweden. 2020, July 13. <https://www.folkhalsomyndigheten.se/contentassets/c1b78bffbde4a7899eb0d8ffdb57b09/covid-19-school-aged-children.pdf>

United Kingdom

National Institute for Health Research.

Are Children More Susceptible to COVID-19? A Rapid Review and Meta-Analysis. 2020, June 10.

https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=190740&VersionID=1343990

Epidemiology of COVID-19 in Children Aged <5 years: A Systematic Review and Metanalysis. 2020, May

18. https://www.crd.york.ac.uk/prospero/display_record.php?RecordID=181936

New Zealand

Ministry of Health. COVID-19 in Children. 2020, May 2.

<https://www.health.govt.nz/system/files/documents/publications/covid-19-in-children-2may2020.pdf>

United States of America

American College of Emergency Physicians. ACEP COVID-19 Field Guide – Pediatric Patients. 2020, June 17.

<https://www.acep.org/corona/covid-19-field-guide/special-populations/pediatric-patients/>

Centers for Disease Control and Prevention

Information for Pediatric Healthcare Providers – Clinical Presentation. 2020, July 17.

<https://www.cdc.gov/coronavirus/2019-ncov/hcp/pediatric-hcp.html#clinical-presentation>

Evaluation and Management Considerations for Neonates at Risk for COVID-19 – Clinical Presentation and Disease Severity. 2020, May 20. <https://www.cdc.gov/coronavirus/2019-ncov/hcp/caring-for-newborns.html#clinical-presentation>

South Korea

Contact Tracing during Coronavirus Disease Outbreak, South Korea, 2020. 2020, July 16.

https://wwwnc.cdc.gov/eid/article/26/10/20-1315_article

International

Couzin-Frankel J, Vogel G, Weil M, et al. School openings across globe suggest ways to keep coronavirus at bay, despite outbreaks. *Science / AAAS*, <https://www.sciencemag.org/news/2020/07/school-openings-across-globe-suggest-ways-keep-coronavirus-bay-despite-outbreaks> (2020, accessed 30 July 2020).

News

NEJM Journal Watch. COVID-19: Italian Province Reports Spike in Kawasaki-Like Disease. 2020, May 13.

<https://www.jwatch.org/fw116636/2020/05/13/covid-19-italian-province-reports-spike-kawasaki-disease>

ARTICLES

Note: References are sorted by year (newest to oldest)

1. Bai K, Liu W, Liu C, et al. Clinical Analysis of 25 COVID-19 Infections in Children. The Pediatric infectious disease journal. 2020;39(7):e100-e3. DOI: 10.1097/INF.0000000000002740

ABSTRACT: BACKGROUND: To describe the characteristics of clinical manifestations of children with 2019 novel coronavirus (2019-nCoV) infection in Chongqing. METHODS: All 25 children with laboratory-confirmed 2019-nCoV infection by real-time reverse transcription-PCR (RNA-PCR) were admitted from the 4 designated treatment hospitals of 2019-nCoV in Chongqing from January 19 to March 12, 2020. Clinical data and epidemiologic history of these patients were retrospectively collected and analyzed. RESULTS: The diagnosis was confirmed through RNA-PCR testing. Among the 25 cases, 14 were males and 11 were females. The median age was 11.0 (6.3-14.5) years (range 0.6-17.0 years). All children were related to a family cluster outbreak, and 7 children (28%) with a travel or residence history in Hubei Province. These patients could be categorized into different clinical types, including 8 (32%) asymptomatic, 4 (16%) very mild cases and 13 (52%) common cases. No severe or critical cases were identified. The most common symptoms were cough (13 cases, 52%) and fever (6 cases, 24%). The duration time of clinical symptoms was 13.0 (8.0-25.0) days. In the 25 cases, on admission, 21 cases (84%) had normal white blood cell counts, while only 2 cases (8%) more than $10 \times 10^9/L$ and 2 cases (8%) less than $4 \times 10^9/L$, respectively; 22 cases (88%) had normal CD4+ T lymphocyte counts, while in the remaining 3 cases (12%) this increased mildly; 23 cases had normal CD8+ T lymphocyte counts, while in the remaining 2 cases (8%) CD8+ T lymphocyte counts were mildly increased as well. All Lymphocyte counts were normal. There were no statistical differences of lab results between the groups of asymptomatic cases, mild cases and common cases. There were only 13 cases with abnormal CT imaging, most of which were located in the subpleural area of the bottom of the lung. All patients were treated with interferon, 6 cases combined with Ribavirin, and 12 cases combined with lopinavir or ritonavir. The days from onset to RNA turning negative was 15.20 +/- 6.54 days. There was no significant difference of RNA turning negative between the groups of interferon, interferon plus ribavirin and interferon plus lopinavir or ritonavir treatment. All the cases recovered and were discharged from hospital. CONCLUSIONS: The morbidity of 2019-nCoV infection in children is lower than in adults and the clinical manifestations and inflammatory biomarkers in children are nonspecific and milder than that in adults. RNA-PCR test is still the most reliable diagnostic method, especially for asymptomatic patients.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32520888>

DOI: 10.1097/INF.0000000000002740

2. Bal ZS, Kurugol Z, Ozkinay F. Clinical features of covid-19 in children. Journal of Pediatric Research. 2020;7(2):88-91.

ABSTRACT: In early December, pneumonia cases of unknown origin started to appear and, on the 7th of January 2020, these cases were declared to be caused by a novel beta-coronavirus according to viral genome sequencing on the 11th of February, 2020. Coronaviruses are enveloped, single strand RNA viruses that have been known to have the ability to mutate rapidly, alter tissue tropism and adjust to different epidemiological situations. As of the end of April 2020, 122,392 laboratory-confirmed cases of COVID-19 had been detected in Turkey, of whom 3,258 died. From the beginning of the COVID-19 epidemic, children seem to be less affected than adults. Therefore, there are limited data regarding the clinical features of COVID-19 in children. The majority of children with confirmed COVID-19 had a history of household contact. The most common symptoms were fever and cough. Previous data suggest that nearly half of patients are afebrile at the onset of the disease. Hospitalization and PICU admission rates for children were lower than for adults. However, PICU admission can be necessitated in children with severe disease. Infants, particularly under the age of 12 months, were more likely to develop severe disease. In children, milder and asymptomatic cases can be challenging and can play a role in transmission. In particular, clinicians should test those children who have a history of family cluster even though they are asymptomatic or present with mild symptoms. Copyright © 2020

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URL: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexb&AN=2006076539>

3. Belot A, Antona D, Renolleau S, et al. SARS-CoV-2-related paediatric inflammatory multisystem syndrome, an epidemiological study, France, 1 March to 17 May 2020. Euro Surveill. 2020;25(22):06. DOI: 10.2807/1560-7917.ES.2020.25.22.2001010

ABSTRACT: End of April 2020, French clinicians observed an increase in cases presenting with paediatric inflammatory multisystem syndrome (PIMS). Nationwide surveillance was set up and demonstrated temporospatial association with the coronavirus disease (COVID-19) epidemic for 156 reported cases as at 17 May: 108 were classified as confirmed (n=79), probable (n=16) or possible (n=13) post-COVID-19 PIMS cases. A continuum of clinical features from Kawasaki-like disease to myocarditis was observed, requiring intensive care in 67% of cases.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32524957>

DOI: 10.2807/1560-7917.ES.2020.25.22.2001010

4. Bhumra S, Malin S, Kirkpatrick L, et al. Clinical Features of Critical Coronavirus Disease 2019 in Children. Pediatric critical care medicine : a journal of the Society of Critical Care Medicine and the World Federation of Pediatric Intensive and Critical Care Societies. 2020;02. DOI: 10.1097/PCC.0000000000002511

ABSTRACT: OBJECTIVES: We sought to describe the presentation, course, and outcomes of hospitalized pediatric coronavirus disease 2019 patients, with detailed description of those requiring mechanical ventilation, and comparisons between critically ill and noncritical hospitalized pediatric patients. DESIGN: Observational cohort study. SETTING: Riley Hospital for Children at Indiana University Health in Indianapolis in the early weeks of the coronavirus disease 2019 pandemic. PATIENTS: All hospitalized pediatric patients with confirmed coronavirus disease 2019 as of May 4, 2020, were included. INTERVENTIONS: Patients received therapies including hydroxychloroquine, remdesivir, tocilizumab, and convalescent serum and were managed according to an institutional algorithm based on evidence available at the time of presentation. MEASUREMENTS AND MAIN RESULTS: Of 407 children tested for severe acute respiratory syndrome-coronavirus 2 at our hospital, 24 were positive, and 19 required hospitalization. Seven (36.8%) were critically ill in ICU, and four (21%) required mechanical ventilation. Hospitalized children were predominantly male (14, 74%) and African-American or Hispanic (14, 74%), with a bimodal distribution of ages among young children less than or equal to 2 years old (8, 42%) and older adolescents ages 15-18 (6, 32%). Five of seven (71.4%) of critically ill patients were African-American (n = 3) or Hispanic (n = 2). Critical illness was associated with older age (p = 0.017), longer duration of symptoms (p = 0.036), and lower oxygen saturation on presentation (p = 0.016); with more thrombocytopenia (p = 0.015); higher C-reactive protein (p = 0.031); and lower WBC count (p = 0.039). Duration of mechanical ventilation averaged 14.1 days. One patient died. CONCLUSIONS: Severe, protracted coronavirus disease 2019 is seen in pediatric patients, including those without significant comorbidities. We observed a greater proportion of hospitalized children requiring mechanical ventilation than has been reported to date. Older children, African-American or Hispanic children, and males may be at risk for severe coronavirus disease 2019 requiring hospitalization. Hypoxia, thrombocytopenia, and elevated C-reactive protein may be useful markers of critical illness. Data regarding optimal management and therapies for pediatric coronavirus disease 2019 are urgently needed.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32639466>

DOI: 10.1097/PCC.0000000000002511

5. Cai X, Ma Y, Li S, et al. Clinical Characteristics of 5 COVID-19 Cases With Non-respiratory Symptoms as the First Manifestation in Children. Front Pediatr. 2020;8:258. DOI: 10.3389/fped.2020.00258

ABSTRACT: An outbreak of the novel coronavirus disease 2019 (COVID-19) occurred in Wuhan, China, in December 2019, which then rapidly spread to more than 80 countries. However, detailed information on the

characteristics of COVID-19 in children is still scarce. Five patients with non-respiratory symptoms as the first manifestation were hospitalized from the emergency department, and were later confirmed to have COVID-19, between 23 January and 20 February 2020, at the Wuhan Children's Hospital. SARS-CoV-2 nucleic acid detection was positive for all the patients. Four of the patients were male and one was female, and their ages ranged from 2-months to 5.6 years. All lived in Wuhan. One patient had a clear history of exposure to SARS-CoV-2, one had a suspected history of exposure, while the others had no exposure history. For three of the five patients, the primary onset disease required an emergency operation or treatment, and included intussusception, acute suppurative appendicitis perforation with local peritonitis, and traumatic subdural hemorrhage with convulsion, while for the other two it was acute gastroenteritis (including one patient with hydronephrosis and a stone in his left kidney). During the course of the disease, four of the five patients had a fever, whereas one case had no fever or cough. Two patients had leukopenia, and one also had lymphopenia. In the two cases of severe COVID-19, the levels of CRP, PCT, serum ferritin, IL-6, and IL-10 were significantly increased, whereas the numbers of CD3+, CD4+, CD8+ T lymphocytes, and CD16 + CD56 natural killer cells were decreased. We also found impaired liver, kidney, and myocardial functions; the presence of hypoproteinemia, hyponatremia, and hypocalcemia; and, in one case, abnormal coagulation function. Except for one patient who had a rotavirus infection, all patients tested negative for common pathogens, including the influenza virus, parainfluenza virus, respiratory syncytial virus, adenovirus, enterovirus, mycoplasma, Chlamydia, and Legionella. Chest CT images of all the patients showed patches or ground-glass opacities in the lung periphery or near the pleura, even large consolidations. This case series is the first report to describe the clinical features of COVID-19 with non-respiratory symptoms as the first manifestation in children.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32574284>

DOI: 10.3389/fped.2020.00258

6. Castagnoli R, Votto M, Licari A, et al. Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Infection in Children and Adolescents: A Systematic Review. JAMA pediatrics. 2020. DOI: 10.1001/jamapediatrics.2020.1467

ABSTRACT: Importance: The current rapid worldwide spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection justifies the global effort to identify effective preventive strategies and optimal medical management. While data are available for adult patients with coronavirus disease 2019 (COVID-19), limited reports have analyzed pediatric patients infected with SARS-CoV-2. Objective: To evaluate currently reported pediatric cases of SARS-CoV-2 infection. Evidence Review: An extensive search strategy was designed to retrieve all articles published from December 1, 2019, to March 3, 2020, by combining the terms coronavirus and coronavirus infection in several electronic databases (PubMed, Cochrane Library, and CINAHL), and following the Preferred Reporting Items for Systematic Reviews and Meta-analyses guidelines. Retrospective cross-sectional and case-control studies, case series and case reports, bulletins, and national reports about the pediatric SARS-CoV-2 infection were included. The risk of bias for eligible observational studies was assessed according to the Strengthening the Reporting of Observational Studies in Epidemiology reporting guideline. Findings: A total of 815 articles were identified. Eighteen studies with 1065 participants (444 patients were younger than 10 years, and 553 were aged 10 to 19 years) with confirmed SARS-CoV-2 infection were included in the final analysis. All articles reflected research performed in China, except for 1 clinical case in Singapore. Children at any age were mostly reported to have mild respiratory symptoms, namely fever, dry cough, and fatigue, or were asymptomatic. Bronchial thickening and ground-glass opacities were the main radiologic features, and these findings were also reported in asymptomatic patients. Among the included articles, there was only 1 case of severe COVID-19 infection, which occurred in a 13-month-old infant. No deaths were reported in children aged 0 to 9 years. Available data about therapies were limited. Conclusions and Relevance: To our knowledge, this is the first systematic review that assesses and summarizes clinical features and management of children with SARS-CoV-2 infection. The rapid spread of COVID-19 across the globe and the lack of European and US data on pediatric patients require further epidemiologic and clinical studies to identify possible preventive and therapeutic strategies.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32320004>

DOI: 10.1001/jamapediatrics.2020.1467

7. Chang TH, Wu JL, Chang LY. Clinical characteristics and diagnostic challenges of pediatric COVID-19: A systematic review and meta-analysis. J Formos Med Assoc. 2020;119(5):982-9. DOI: 10.1016/j.jfma.2020.04.007

ABSTRACT: BACKGROUND/PURPOSE: Current studies on pediatric coronavirus disease 2019 (COVID-19) are rare. The clinical characteristics and spectrum are still unknown. Facing this unknown and emerging pathogen, we aimed to collect current evidence about COVID-19 in children. METHODS: We performed a systematic review in PubMed and Embase to find relevant case series. Because some reports were published in Chinese journals, the journals and publications of the Chinese Medical Association related to COVID-19 were completely reviewed. A random effects model was used to pool clinical data in the meta-analysis. RESULTS: Nine case series were included. In the pooled data, most of patients (75%) had a household contact history. The disease severity was mainly mild to moderate (98%). Only 2 children (2%) received intensive care. Fever occurred in 59% of the patients, while cough in 46%. Gastrointestinal symptoms (12%) were uncommon. There are 26% children are asymptomatic. The most common radiographic finding was ground glass opacities (48%). Currently, there is no evidence of vertical transmission to neonates born to mothers with COVID-19. Compared with the most relevant virus, SARS-CoV, SARS-CoV-2 causes less severe disease. CONCLUSION: COVID-19 has distinct features in children. The disease severity is mild. Current diagnosis is based mainly on typical ground glass opacities on chest CT, epidemiological suspicion and contact tracing.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32307322>

DOI: 10.1016/j.jfma.2020.04.007

8. Chao JY, Derespina KR, Herold BC, 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. Journal of Pediatrics. 2020;223:14-9.e2.

ABSTRACT: Objective: To describe the clinical profiles and risk factors for critical illness in hospitalized children and adolescents with coronavirus disease 2019 (COVID-19). Study design: Children 1 month to 21 years of age with COVID-19 from a single tertiary care children's hospital between March 15 and April 13, 2020 were included. Demographic and clinical data were collected. Result(s): In total, 67 children tested positive for COVID-19; 21 (31.3%) were managed as outpatients. Of 46 admitted patients, 33 (72%) were admitted to the general pediatric medical unit and 13 (28%) to the pediatric intensive care unit (PICU). Obesity and asthma were highly prevalent but not significantly associated with PICU admission ($P = .99$). Admission to the PICU was significantly associated with higher C-reactive protein, procalcitonin, and pro-B type natriuretic peptide levels and platelet counts ($P < .05$ for all). Patients in the PICU were more likely to require high-flow nasal cannula ($P = .0001$) and were more likely to have received Remdesivir through compassionate release ($P < .05$). Severe sepsis and septic shock syndromes were observed in 7 (53.8%) patients in the PICU. Acute respiratory distress syndrome was observed in 10 (77%) PICU patients, 6 of whom (46.2%) required invasive mechanical ventilation for a median of 9 days. Of the 13 patients in the PICU, 8 (61.5%) were discharged home, and 4 (30.7%) patients remain hospitalized on ventilatory support at day 14. One patient died after withdrawal of life-sustaining therapy because of metastatic cancer. Conclusion(s): We describe a higher than previously recognized rate of severe disease requiring PICU admission in pediatric patients admitted to the hospital with COVID-19. Copyright © 2020 Elsevier Inc.

URL: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexb&AN=2007067943>

9. Chen XB, Du SH, Lu JC, et al. Retrospective Analysis of 61 Cases of Children Died of Viral Pneumonia. Fa Yi Xue Za Zhi. 2020;36(2):164-8. DOI: 10.12116/j.issn.1004-5619.2020.02.003

ABSTRACT: Abstract: Objective To retrospectively analyze the forensic pathological postmortem examination and clinical data of children who died of viral pneumonia in identification of cause of death cases and to discuss

the clinical characteristics and pathological features of viral pneumonia in children, in order to provide reference to pathological diagnosis of viral pneumonia in children caused by 2019 novel coronavirus 2019-nCoV infection. Methods Postmortem examination data from 61 cases of children whose causes of death were identified as viral pneumonia in recent years were collected from the Center of Forensic Identification, Southern Medical University. The gender, age, clinical symptoms and pathological features were comparatively analyzed. Results Among the 61 cases of children who died of viral pneumonia, most were within 2 years old 83.61%, and a large proportion died within 2 weeks after the onset of the disease 91.80%. Gross changes in postmortem examination included respiratory mucosal hyperemia, pleural effusion, pulmonary swelling, variegated pulmonary pleura and serosa, as well as focal pulmonary hemorrhage and pulmonary edema. A large proportion of sick children had enlarged mesenteric lymph nodes 83.61% and thymic dysplasia 21.31%. Histopathological changes included edema of alveoli and interstitial substance, pneumorrhagiashedding of alveolar epithelial cells, serous and or fibrous exudation in the alveoli, formation of viral inclusions, formation of transparent membranes, infiltration of inflammatory cells that mainly consisted of macrophages and lymphocytes in interstitial substance and alveoli. Viral infections often affected the heart and gastrointestinal tract. Conclusion The clinical symptoms of children with viral pneumonia are difficult to notice, and because the immune systems of children are not fully developed and they have poor immunity, they can easily become severely ill and even die. Analyzing the forensic autopsies and the histopathological characteristics could provide reference for pathological diagnosis of viral pneumonia.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32530160>

DOI: 10.12116/j.issn.1004-5619.2020.02.003

10. Choi SH, Kim HW, Kang JM, et al. Epidemiology and clinical features of coronavirus disease 2019 in children. Clin Exp Pediatr. 2020;63(4):125-32. DOI: 10.3345/cep.2020.00535

ABSTRACT: Coronavirus disease-2019 (COVID-19), which started in Wuhan, China, in December 2019 and declared a worldwide pandemic on March 11, 2020, is a novel infectious disease that causes respiratory illness and death. Pediatric COVID-19 accounts for a small percentage of patients and is often milder than that in adults; however, it can progress to severe disease in some cases. Even neonates can suffer from COVID-19, and children may spread the disease in the community. This review summarizes what is currently known about COVID-19 in children and adolescents.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32252139>

DOI: 10.3345/cep.2020.00535

11. Ciuca IM. COVID-19 in Children: An Ample Review. Risk Manag Healthc Policy. 2020;13:661-9. DOI: 10.2147/RMHP.S257180

ABSTRACT: The aim of this review was to describe the current knowledge about coronavirus disease 2019 (COVID-19, which is caused by severe acute respiratory syndrome coronavirus 2 [SARS-CoV-2]) in children, from epidemiological, clinical, and laboratory perspectives, including knowledge on the disease course, treatment, and prognosis. An extensive literature search was performed to identify papers on COVID-19 (SARS-CoV-2 infection) in children, published between January 1, 2020 and April 1, 2020. There were 44 relevant papers on COVID-19 in children. The results showed that COVID-19 occurs in 0.39-12.3% of children. Clinical signs and symptoms are comparable to those in adults, but milder forms and a large percentage of asymptomatic carriers are found among children. Elevated inflammatory markers are associated with complications and linked to various co-infections. Chest computed tomography (CT) scans in children revealed structural changes similar to those found in adults, with consolidations surrounded by halos being somewhat specific for children with COVID-19. The recommended treatment includes providing symptomatic therapy, with no specific drug recommendations for children. The prognosis is much better for children compared to adults. This review highlights that COVID-19 in children is similar to the disease in the adult population, but with particularities regarding clinical manifestations, laboratory test results, chest imaging, and treatment. The prognosis is much

better for children compared to adults, but with the progression of the pandemic; the cases in children might change in the future.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32636686>

DOI: 10.2147/RMHP.S257180

12. De Bernardo G, Giordano M, Zollo G, et al. The clinical course of SARS-CoV-2 positive neonates. J Perinatol. 2020. DOI: 10.1038/s41372-020-0715-0

ABSTRACT: The COVID-19 pneumonia was firstly reported in Wuhan, China, in December 2019. The disease had a rapid spread all over the world becoming an international public health emergency. Limited data were available on COVID-19 positive neonates. We reviewed relevant literature to understand the clinical course of disease and transmission routes in affected neonates. The aim of the study was evaluating the clinical course and prognosis of SARS-CoV-2 positive neonates. Based on current literature, the hypothesis of vertical transmission of SARS-CoV-2, though conceivable, remains unproven. A research conducted on PubMed database from December 2019 to April 27, 2020 revealed that were reported 25 neonates affected by SARS-CoV-2. Main symptoms were fever, cough, or shortness of breath but often these neonates did not show other symptoms during length stay in hospital. No deaths occurred.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32632198>

DOI: 10.1038/s41372-020-0715-0

13. De Rose DU, Piersigilli F, Ronchetti MP, et al. Novel Coronavirus disease (COVID-19) in newborns and infants: what we know so far. Ital J Pediatr. 2020;46(1):56. DOI: 10.1186/s13052-020-0820-x

ABSTRACT: Recently, an outbreak of viral pneumonitis in Wuhan, Hubei, China successively spread as a global pandemic, led to the identification of a novel betacoronavirus species, the 2019 novel coronavirus, successively designated 2019-nCoV then SARS-CoV-2). The SARS-CoV-2 causes a clinical syndrome designated coronavirus disease 2019 (COVID19) with a spectrum of manifestations ranging from mild upper respiratory tract infection to severe pneumonitis, acute respiratory distress syndrome (ARDS) and death. Few cases have been observed in children and adolescents who seem to have a more favorable clinical course than other age groups, and even fewer in newborn babies. This review provides an overview of the knowledge on SARS-CoV-2 epidemiology, transmission, the associated clinical presentation and outcomes in newborns and infants up to 6 months of life.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32349772>

DOI: 10.1186/s13052-020-0820-x

14. De Sanctis V, Ruggiero L, Soliman AT, et al. Coronavirus Disease 2019 (COVID-19) in adolescents: An update on current clinical and diagnostic characteristics. Acta Biomed. 2020;91(2):184-94. DOI: 10.23750/abm.v91i2.9543

ABSTRACT: The current outbreak of infections with SARS-CoV-2 is defined as Coronavirus Disease 2019 (COVID-19). The clinical symptoms of COVID-19 include fever, fatigue, cough, breathing difficulty that may lead to respiratory distress; a small population of patients may have diarrhea, nausea or vomiting. The highest infection rate occurs in adults; however, neonates, children, and adolescents can also be infected. As the outbreak continues to spread worldwide, attention has switched toward determinants of clinical manifestations and disease severity. The situation surrounding the outbreak is rapidly evolving and the information and recommendations are changing as new information becomes available. This paper summarises the current findings (April 3, 2020) from a systematic literature review on the current knowledge of COVID-19 in adolescents (10-19 years according to the WHO definition) and reports the preliminary epidemiological data stated by the Italian National Institute of Health.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32420943>

DOI: 10.23750/abm.v91i2.9543

15. de Souza TH, Nadal JA, Nogueira RJN, et al. Clinical manifestations of children with COVID-19: A systematic review. *Pediatr Pulmonol.* 2020;55(8):1892-9. DOI: 10.1002/ppul.24885

ABSTRACT: BACKGROUND: The coronavirus disease 2019 (COVID-19) outbreak is an unprecedented global public health challenge, leading to thousands of deaths every day worldwide. Despite the epidemiological importance, clinical patterns of children with COVID-19 remain unclear. The aim of this study was to describe the clinical, laboratorial, and radiological characteristics of children with COVID-19. METHODS: The Medline database was searched between December 1st 2019 and April 6th 2020. No language restrictions were applied. Inclusion criteria were (a) studied patients younger than 18 years old; (b) presented original data from cases of COVID-19 confirmed by reverse-transcription polymerase chain reaction; and (c) contained descriptions of clinical manifestations, laboratory tests, or radiological examinations. RESULTS: A total of 38 studies (1124 cases) were included. From all the cases, 1117 had their severity classified: 14.2% were asymptomatic, 36.3% were mild, 46.0% were moderate, 2.1% were severe, and 1.2% were critical. The most prevalent symptom was fever (47.5%), followed by cough (41.5%), nasal symptoms (11.2%), diarrhea (8.1%), and nausea/vomiting (7.1%). One hundred forty-five (36.9%) children were diagnosed with pneumonia and 43 (10.9%) upper airway infections were reported. Reduced lymphocyte count was reported in 12.9% of cases. Abnormalities in computed tomography were reported in 63.0% of cases. The most prevalent abnormalities reported were ground-glass opacities, patchy shadows, and consolidations. Only one death was reported. CONCLUSIONS: Clinical manifestations of children with COVID-19 differ widely from adult cases. Fever and respiratory symptoms should not be considered a hallmark of COVID-19 in children.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32492251>

DOI: 10.1002/ppul.24885

16. Derespina KR, Kaushik S, Plichta A, et al. Clinical Manifestations and Outcomes of Critically Ill Children and Adolescents with COVID-19 in New York City. *J Pediatr.* 2020;15. DOI: 10.1016/j.jpeds.2020.07.039

ABSTRACT: OBJECTIVES: To describe the clinical manifestations and outcomes of critically ill children with coronavirus disease-19 (COVID-19) in New York City. STUDY DESIGN: Retrospective observational study of children 1 month to 21 years admitted March 14 to May 2, 2020 to 9 New York City pediatric intensive care units (PICUs) with SARS-CoV-2 infection. RESULTS: Of 70 children admitted to PICUs: median age 15 [IQR 9, 19] years; 61.4% male; 38.6% Hispanic; 32.9% Black; 74.3% with comorbidities. Fever (72.9%) and cough (71.4%) were the common presenting symptoms. Twelve patients (17%) met severe sepsis criteria; 14 (20%) required vasopressor support; 21 (30%) developed acute respiratory distress syndrome (ARDS); 9 (12.9%) met acute kidney injury criteria; 1 (1.4%) required renal replacement therapy, and 2 (2.8%) had cardiac arrest. For treatment, 27 (38.6%) patients received hydroxychloroquine; 13 (18.6%) remdesivir; 23 (32.9%) corticosteroids; 3 (4.3%) tocilizumab; 1 (1.4%) anakinra; no patient was given immunoglobulin or convalescent plasma. Forty-nine (70%) patients required respiratory support: 14 (20.0%) non-invasive mechanical ventilation, 20 (28.6%) invasive mechanical ventilation (IMV), 7 (10%) prone position, 2 (2.8%) inhaled nitric oxide, and 1 (1.4%) extracorporeal membrane oxygenation. Nine (45%) of the 20 patients requiring IMV were extubated by day 14 with median IMV duration of 218 [IQR 79, 310.4] hours. Presence of ARDS was significantly associated with duration of PICU and hospital stay, and lower probability of PICU and hospital discharge at hospital day 14 ($P < .05$ for all). CONCLUSIONS: Critically ill children with COVID-19 predominantly are adolescents, have comorbidities, and require some form of respiratory support. The presence of ARDS is significantly associated with prolonged PICU and hospital stay.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32681989>

DOI: 10.1016/j.jpeds.2020.07.039

17. Dhochak N, Singhal T, Kabra SK, et al. Pathophysiology of COVID-19: Why Children Fare Better than Adults? *Indian J Pediatr.* 2020;87(7):537-46. DOI: 10.1007/s12098-020-03322-y

ABSTRACT: The world is facing Coronavirus Disease-2019 (COVID-19) pandemic, which is causing a large number of deaths and burden on intensive care facilities. It is caused by Severe Acute Respiratory Syndrome coronavirus-2 (SARS-CoV-2) originating in Wuhan, China. It has been seen that fewer children contract COVID-19 and among

infected, children have less severe disease. Insights in pathophysiological mechanisms of less severity in children could be important for devising therapeutics for high-risk adults and elderly. Early closing of schools and day-care centers led to less frequent exposure and hence, lower infection rate in children. The expression of primary target receptor for SARS-CoV-2, i.e. angiotensin converting enzyme-2 (ACE-2), decreases with age. ACE-2 has lung protective effects by limiting angiotensin-2 mediated pulmonary capillary leak and inflammation. Severe COVID-19 disease is associated with high and persistent viral loads in adults. Children have strong innate immune response due to trained immunity (secondary to live-vaccines and frequent viral infections), leading to probably early control of infection at the site of entry. Adult patients show suppressed adaptive immunity and dysfunctional over-active innate immune response in severe infections, which is not seen in children. These could be related to immune-senescence in elderly. Excellent regeneration capacity of pediatric alveolar epithelium may be contributing to early recovery from COVID-19. Children, less frequently, have risk factors such as co-morbidities, smoking, and obesity. But young infants and children with pre-existing illnesses could be high risk groups and need careful monitoring. Studies describing immune-pathogenesis in COVID-19 are lacking in children and need urgent attention.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32410003>

DOI: 10.1007/s12098-020-03322-y

18. Di Nardo M, van Leeuwen G, Loreti A, et al. A literature review of 2019 novel coronavirus (SARS-CoV2) infection in neonates and children. *Pediatric research*. 2020. DOI: 10.1038/s41390-020-1065-5

ABSTRACT: At the time of writing, there are already millions of documented infections worldwide by the novel coronavirus 2019 (2019-nCoV or severe acute respiratory syndrome coronavirus 2 (SARS-CoV2)), with hundreds of thousands of deaths. The great majority of fatal events have been recorded in adults older than 70 years; of them, a large proportion had comorbidities. Since data regarding the epidemiologic and clinical characteristics in neonates and children developing coronavirus disease 2019 (COVID-19) are scarce and originate mainly from one country (China), we reviewed all the current literature from 1 December 2019 to 7 May 2020 to provide useful information about SARS-CoV2 viral biology, epidemiology, diagnosis, clinical features, treatment, prevention, and hospital organization for clinicians dealing with this selected population. **IMPACT:** Children usually develop a mild form of COVID-19, rarely requiring high-intensity medical treatment in pediatric intensive care unit. Vertical transmission is unlikely, but not completely excluded. Children with confirmed or suspected COVID-19 must be isolated and healthcare workers should wear appropriate protective equipment. Some clinical features (higher incidence of fever, vomiting and diarrhea, and a longer incubation period) are more common in children than in adults, as well as some radiologic aspects (more patchy shadow opacities on CT scan images than ground-glass opacities). Supportive and symptomatic treatments (oxygen therapy and antibiotics for preventing/treating bacterial coinfections) are recommended in these patients.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32679582>

DOI: 10.1038/s41390-020-1065-5

19. Ding Y, Yan H, Guo W. Clinical Characteristics of Children With COVID-19: A Meta-Analysis. *Front Pediatr*. 2020;8(431):431. DOI: 10.3389/fped.2020.00431

ABSTRACT: Background: With the global spread of novel coronavirus disease 2019 (COVID-19), health care systems are facing formidable challenges. Scientists are conducting studies to explore this new disease, and numerous studies have been shared. However, the number of studies on children with COVID-19 is limited, and no meta-analysis of this group has been performed. Methods: A random-effect meta-analysis was conducted to determine the characteristics of children with COVID-19, including their demographic, epidemiological, clinical, laboratory, imaging features, and outcomes. Four databases and reference lists were screened. Percentages were calculated, and pooled prevalence with 95% confidence intervals (CIs) were reported. Results: Of 195 studies, 33 were selected, and 14 (371 patients) of them were included in the meta-analysis. Then, 19 case reports (25 patients) were summarized separately. Our meta-analysis revealed that 17.4% (95% CI = 9.1-27.3) of children had asymptomatic infection. Fever (51.2%, 95% CI = 40.2-62.2) and cough (37.0%, 95% CI = 25.9-48.8)

were the most frequent symptoms. The prevalence of severe or critical illness was almost 0% (95% CI = 0-1.0). The most frequent abnormal laboratory findings, in pediatric patients, were leukopenia/lymphopenia (28.9%, 95% CI = 19.5-39.2) and increased creatine kinase (20.1%, 95% CI = 1.3-49.9). Ground-glass opacity was observed in the CT scan of 53.9% (95% CI = 38.4-68.7) of children diagnosed with pneumonia. Conclusions: Children are at a lower risk of developing COVID-19 and have a milder disease than adults. However, the evidence presented in this study is not satisfactory. Further investigations are urgently needed, and our data will be continuously updated.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32719759>

DOI: 10.3389/fped.2020.00431

20. Dong Y, Mo X, Hu Y, et al. Epidemiology of COVID-19 Among Children in China. *Pediatrics*. 2020;145(6):06.

DOI: 10.1542/peds.2020-0702

ABSTRACT: OBJECTIVE: To identify the epidemiological characteristics and transmission patterns of pediatric patients with the 2019 novel coronavirus disease (COVID-19) in China. METHODS: Nationwide case series of 2135 pediatric patients with COVID-19 reported to the Chinese Center for Disease Control and Prevention from January 16, 2020, to February 8, 2020, were included. The epidemic curves were constructed by key dates of disease onset and case diagnosis. Onset-to-diagnosis curves were constructed by fitting a log-normal distribution to data on both onset and diagnosis dates. RESULTS: There were 728 (34.1%) laboratory-confirmed cases and 1407 (65.9%) suspected cases. The median age of all patients was 7 years (interquartile range: 2-13 years), and 1208 case patients (56.6%) were boys. More than 90% of all patients had asymptomatic, mild, or moderate cases. The median time from illness onset to diagnoses was 2 days (range: 0-42 days). There was a rapid increase of disease at the early stage of the epidemic, and then there was a gradual and steady decrease. The disease rapidly spread from Hubei province to surrounding provinces over time. More children were infected in Hubei province than any other province. CONCLUSIONS: Children of all ages appeared susceptible to COVID-19, and there was no significant sex difference. Although clinical manifestations of children's COVID-19 cases were generally less severe than those of adult patients, young children, particularly infants, were vulnerable to infection. The distribution of children's COVID-19 cases varied with time and space, and most of the cases were concentrated in Hubei province and surrounding areas. Furthermore, this study provides strong evidence of human-to-human transmission.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32179660>

DOI: 10.1542/peds.2020-0702

21. Du H, Dong X, Zhang JJ, et al. Clinical characteristics of 182 pediatric COVID-19 patients with different severities and allergic status. *Allergy*. 2020;10. DOI: 10.1111/all.14452

ABSTRACT: BACKGROUND: The pandemic of coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection has made widespread impact recently. We aim to investigate the clinical characteristics of COVID-19 children with different severities and allergic status. METHODS: Data extracted from the electronic medical records, including demographics, clinical manifestations, comorbidities, laboratory and immunological results and radiological images of 182 hospitalized COVID-19 children were summarized and analyzed. RESULTS: The median age was 6 years old, ranging from 3 days to 15 years, and there were more boys (male-female ratio about 2:1) within the studied 182 patients. Most of the children were infected by family members. Fever (43.4%) and dry cough (44.5%) were common symptoms, and gastrointestinal manifestations accounted for 11.0%, including diarrhea, abdominal discomfort and vomiting. 71.4% had abnormal chest computed tomography (CT) scan images, and typical signs of pneumonia were ground-glass opacity and local patchy shadowing on admission. Laboratory results were mostly within normal ranges, and only a small ratio of lymphopenia (3.9%) and eosinopenia (29.5%) were observed. The majority (97.8%) of infected children were not severe, and 24 (13.2%) of them had asymptomatic infections. Compared to children without pneumonia (manifested as asymptomatic and acute upper respiratory infection), children with pneumonia were associated with higher percentages of the comorbidity history, symptoms of

fever and cough, and increased levels of serum procalcitonin, alkaline phosphatase and serum interleukins (IL)-2, IL-4, IL-6, IL-10 and TNF-alpha. There were no differences of treatments, duration of hospitalization, time from first positive to first negative nucleic acid testing and outcomes between children with mild pneumonia and without pneumonia. All the hospitalized COVID-19 children had recovered except one death due to intussusception and sepsis. In 43 allergic children with COVID-19, allergic rhinitis (83.7%) was the major disease, followed by drug allergy, atopic dermatitis, food allergy and asthma. Demographics and clinical features were not significantly different between allergic and non-allergic groups. Allergic patients showed less increase in acute phase reactants, procalcitonin, D-dimer and aspartate aminotransferase levels compared to all patients. Immunological profiles including circulating T, B and NK lymphocyte subsets, total immunoglobulin and complement levels and serum cytokines did not show any difference in allergic and pneumonia groups. Neither eosinophil counts nor serum total immunoglobulin E (IgE) levels showed a significant correlation with other immunological measures, such as other immunoglobulins, complements, lymphocyte subsets numbers and serum cytokine levels. CONCLUSION: Pediatric COVID-19 patients tended to have a mild clinical course. Patients with pneumonia had higher proportion of fever and cough and increased inflammatory biomarkers than those without pneumonia. There was no difference between allergic and non-allergic COVID-19 children in disease incidence, clinical features, laboratory and immunological findings. Allergy was not a risk factor for developing and severity of SARS-CoV-2 infection and hardly influenced the disease course of COVID-19 in children.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32524611>

DOI: 10.1111/all.14452

22. Du W, Yu J, Wang H, et al. Clinical characteristics of COVID-19 in children compared with adults in Shandong Province, China. *Infection*. 2020;48(3):445-52. DOI: 10.1007/s15010-020-01427-2

ABSTRACT: AIMS AND BACKGROUND: The COVID-19 outbreak spread in China and is a threat to the world. We reported on the epidemiological, clinical, laboratory, and radiological characteristics of children cases to help health workers better understand and provide timely diagnosis and treatment. METHODS: Retrospectively, two research centers' case series of 67 consecutive hospitalized cases including 53 adult and 14 children cases with COVID-19 between 23 Jan 2020 and 15 Feb 2020 from Jinan and Rizhao were enrolled in this study. Epidemiological, clinical, laboratory, and radiological characteristics of children and adults were analyzed and compared. RESULTS: Most cases in children were mild (21.4%) and conventional cases (78.6%), with mild clinical signs and symptoms, and all cases were of family clusters. Fever (35.7%) and dry cough (21.4%) were described as clinical manifestations in children cases. Dry cough and phlegm were not the most common symptoms in children compared with adults ($p = 0.03$). In the early stages of the disease, lymphocyte counts did not significantly decline but neutrophils count did in children compared with adults ($p = 0.02$). There was a lower level of CRP ($p = 0.00$) in children compared with adults. There were 8 (57.1%) asymptomatic cases and 6 (42.9%) symptomatic cases among the 14 children cases. The age of asymptomatic patients was younger than that of symptomatic patients ($p = 0.03$). Even among asymptomatic patients, 5 (62.5%) cases had lung injuries including 3 (60%) cases with bilateral involvement, which was not different compared with that of symptomatic cases ($p = 0.58$, $p = 0.74$). CONCLUSIONS: The clinical symptoms of children are mild, there is substantial lung injury even among children, but that there is less clinical disease, perhaps because of a less pronounced inflammatory response, and that the occurrence of this pattern appears to inversely correlate with age.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32301099>

DOI: 10.1007/s15010-020-01427-2

23. Duan YN, Zhu YQ, Tang LL, et al. CT features of novel coronavirus pneumonia (COVID-19) in children. *Eur Radiol*. 2020;30(8):4427-33. DOI: 10.1007/s00330-020-06860-3

ABSTRACT: A serious epidemic of COVID-19 broke out in Wuhan, Hubei Province, China, and spread to other Chinese cities and several countries now. As the majority of patients infected with COVID-19 had chest CT abnormality, chest CT has become an important tool for early diagnosis of COVID-19 and monitoring disease progression. There is growing evidence that children are also susceptible to COVID-19 and have atypical

presentations compared with adults. This review is mainly about the differences in clinical symptom spectrum, diagnosis of COVID-19, and CT imaging findings between adults and children, while highlighting the value of radiology in prevention and control of COVID-19 in pediatric patients. KEY POINTS: * Compared with adults, pediatric patients with COVID-19 have the characteristics of lower incidence, slighter clinical symptoms, shorter course of disease, and fewer severe cases. * The chest CT characteristics of COVID-19 in pediatric patients were atypical, with more localized GGO extent, lower GGO attenuation, and relatively rare interlobular septal thickening. * Chest CT should be used with more caution in pediatric patients with COVID-19 to protect this vulnerable population from risking radiation.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32291501>

DOI: 10.1007/s00330-020-06860-3

24. Evliyaoglu O, Kilinc AA, Onal P, et al. COVID-19 in children. Turk Pediatri Ars. 2020;55(2):85. DOI: 10.14744/TurkPediatriArs.2020.07742

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32684751>

DOI: 10.14744/TurkPediatriArs.2020.07742

25. Fakiri KE, Nassih H, Sab IA, et al. Epidemiology and Clinical Features of Coronavirus Disease 2019 in Moroccan Children. Indian pediatrics. 2020;07.

ABSTRACT: OBJECTIVES: This study aims to analyze the epidemiological and clinical features of coronavirus disease 19 (COVID-19) in a Moroccan pediatric population. METHODS: A retrospective study of a cohort of 74 children with RT-PCR confirmed COVID-19. We collected information on clinical and laboratory features of all children (age <18 years) admitted between 2 March, 2020 and 1 April, 2020. RESULTS: The mean (SD) age of the 74 children (40 girls) was 7 (1.5) years. The mean (SD) time from illness onset to diagnosis was 2 (1) days. 54 children were asymptomatic, while eight had fever, and five cases had cough. Recovery was after a mean (SD) of 12 (1) days. CONCLUSION: COVID-19 was mostly mild in the pediatric population in Morocco.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32651306>

26. Foster CE, Moulton EA, Munoz FM, et al. Coronavirus Disease 2019 in Children Cared for at Texas Children's Hospital: Initial Clinical Characteristics and Outcomes. Journal of the Pediatric Infectious Diseases Society. 2020;9(3):373-7.

ABSTRACT: We describe the clinical course of 57 children with coronavirus disease 2019 (COVID-19) cared for through a single hospital system. Most children were mildly symptomatic, and only a few patients with underlying medical conditions required hospitalization. Systemwide patient evaluation processes allowed for prompt identification and management of patients with COVID-19. Copyright © The Author(s) 2020. Published by Oxford University Press on behalf of The Journal of the Pediatric Infectious Diseases Society. All rights reserved. For permissions, please e-mail: journals.permissions@oup.com.

URL: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexb&AN=632007022>

27. Gaborieau L, Delestrain C, Bensaid P, et al. Epidemiology and Clinical Presentation of Children Hospitalized with SARS-CoV-2 Infection in Suburbs of Paris. J Clin Med. 2020;9(7):1-10. DOI: 10.3390/jcm9072227

ABSTRACT: Understanding the clinical presentation of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection and prognosis in children is a major issue. Children often present mild symptoms, and some severe forms require paediatric intensive care, with in some cases a fatal prognosis. Our aim was to identify the epidemiological characteristics, clinical presentation, and prognosis of children with coronavirus disease 2019 (Covid-19) hospitalized in Paris suburb hospitals. In this prospective, observational, multicentre study, we included children hospitalized in paediatric departments of Paris suburb hospitals from 23 March 2020 to 10 May 2020, during the national lockdown in France with confirmed SARS-CoV-2 infection (positive RNA test on a nasopharyngeal swab) or highly suspected infection (clinical, biological, and/or radiological data features suggestive for SARS-CoV-2 infection). A total of 192 children were included for confirmed (n = 157) or highly

suspected (n = 35) SARS-CoV-2 infection. The median age was one year old (interquartile range 0.125-11) with a sex ratio 1.3:1. Fever was recorded in 147 (76.6%) children and considered poorly tolerated in 29 (15.1%). The symptoms ranged from rhinorrhoea (34.4%) and gastrointestinal (35.5%) to respiratory distress (25%). Only 10 (5.2%) children had anosmia and five (2.6%) had chest pain. An underlying condition was identified in almost 30% of the children in our study. Overall, 24 (12.5%) children were admitted to paediatric intensive care units, 12 required mechanical ventilation, and three died. For children in Paris suburbs, most cases of Covid-19 showed mild or moderate clinical expression. However, one-eighth of children were admitted to paediatric intensive care units and three died.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32674306>

DOI: 10.3390/jcm9072227

28. Garazzino S, Montagnani C, Dona D, et al. Multicentre Italian study of SARS-CoV-2 infection in children and adolescents, preliminary data as at 10 April 2020. Euro Surveill. 2020;25(18):2000600. DOI: 10.2807/1560-7917.ES.2020.25.18.2000600

ABSTRACT: Data on features of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in children and adolescents are scarce. We report preliminary results of an Italian multicentre study comprising 168 laboratory-confirmed paediatric cases (median: 2.3 years, range: 1 day-17.7 years, 55.9% males), of which 67.9% were hospitalised and 19.6% had comorbidities. Fever was the most common symptom, gastrointestinal manifestations were frequent; two children required intensive care, five had seizures, 49 received experimental treatments and all recovered.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32400362>

DOI: 10.2807/1560-7917.ES.2020.25.18.2000600

29. Götzinger F, Santiago-García B, Noguera-Julían A, et al. COVID-19 in children and adolescents in Europe: a multinational, multicentre cohort study. The Lancet Child & Adolescent Health. 2020. DOI: 10.1016/s2352-4642(20)30177-2

ABSTRACT: Background To date, few data on paediatric COVID-19 have been published, and most reports originate from China. This study aimed to capture key data on children and adolescents with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection across Europe to inform physicians and health-care service planning during the ongoing pandemic.

URL: [https://doi.org/10.1016/S2352-4642\(20\)30177-2](https://doi.org/10.1016/S2352-4642(20)30177-2)

DOI: 10.1016/s2352-4642(20)30177-2

30. Henry BM, Benoit SW, de Oliveira MHS, et al. Laboratory abnormalities in children with mild and severe coronavirus disease 2019 (COVID-19): A pooled analysis and review. Clin Biochem. 2020;81:1-8. DOI: 10.1016/j.clinbiochem.2020.05.012

ABSTRACT: Limited data exists to-date on the laboratory findings in children with COVID-19, warranting the conduction of this study, in which we pool the currently available literature data on the laboratory findings seen in children with mild and severe COVID-19. Following an extensive literature search, we identified 24 eligible studies, including a total of 624 pediatric cases with laboratory-confirmed COVID-19, which report data on 27 different biomarkers. We then performed a meta-analysis to calculate the pooled prevalence estimates (PPE) for these laboratory abnormalities in mild COVID-19. As data was too limited for children with severe COVID-19 to allow pooling, results were presented descriptively in a summary of findings table. Our data show an inconsistent pattern of change in the leukocyte index of mild and severe cases of COVID-19 in children. Specifically, changes in leukocyte counts were only observed in 32% of the mild pediatric cases (PPE: 13% increase, 19% decrease). In mild disease, creatine kinase-MB (CK-MB) was frequently elevated, with a PPE of 33%. In severe disease, c-reactive protein (CRP), procalcitonin (PCT), and lactate dehydrogenase (LDH) were frequently elevated. Based on data obtained from early COVID-19 studies, leukocyte indices in children appear inconsistent, differing from those reported in adults that highlight specific leukocyte trends. This brings into

question the utility and reliability of such parameters in monitoring disease severity in the pediatric population. Instead, we suggest physicians to serially monitor CRP, PCT, and LDH to track the course of illness in hospitalized children. Finally, elevated CK-MB in mild pediatric COVID-19 cases is indicative of possible cardiac injury. This highlights the importance of monitoring cardiac biomarkers in hospitalized patients and the need for further investigation of markers such as cardiac troponin in future studies.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32473151>

DOI: 10.1016/j.clinbiochem.2020.05.012

31. Hoang A, Chorath K, Evans M, et al. COVID-19 in 7780 pediatric patients: A systematic review. *EClinicalMedicine*. 2020;(no pagination)(100433).

ABSTRACT: Background: Studies summarizing the clinical picture of COVID-19 in children are lacking. This review characterizes clinical symptoms, laboratory, and imaging findings, as well as therapies provided to confirmed pediatric cases of COVID-19. Method(s): Adhering to PRISMA guidelines, we searched four medical databases (PubMed, LitCovid, Scopus, WHO COVID-19 database) between December 1, 2019 to May 14, 2020 using the keywords "novel coronavirus", "COVID-19" or "SARS-CoV-2". We included published or in press peer-reviewed cross-sectional, case series, and case reports providing clinical signs, imaging findings, and/or laboratory results of pediatric patients who were positive for COVID-19. Risk of bias was appraised through the quality assessment tool published by the National Institutes of Health. PROSPERO registration # CRD42020182261. Finding(s): We identified 131 studies across 26 countries comprising 7780 pediatric patients. Although fever (59.1%) and cough (55.9%) were the most frequent symptoms 19.3% of children were asymptomatic. Patchy lesions (21.0%) and ground-glass opacities (32.9%) depicted lung radiograph and computed tomography findings, respectively. Immunocompromised children or those with respiratory/cardiac disease comprised the largest subset of COVID-19 children with underlying medical conditions (152 of 233 individuals). Coinfections were observed in 5.6% of children and abnormal laboratory markers included serum D-dimer, procalcitonin, creatine kinase, and interleukin-6. Seven deaths were reported (0.09%) and 11 children (0.14%) met inclusion for multisystem inflammatory syndrome in children. Interpretation(s): This review provides evidence that children diagnosed with COVID-19 have an overall excellent prognosis. Future longitudinal studies are needed to confirm our findings and better understand which patients are at increased risk for developing severe inflammation and multiorgan failure. Funding(s): Parker B. Francis and pilot grant from 2R25-HL126140. Funding agencies had no involvement in the study. Copyright © 2020 The Author(s)

URL: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexb&AN=2007030303>

32. Hong H, Wang Y, Chung HT, et al. Clinical characteristics of novel coronavirus disease 2019 (COVID-19) in newborns, infants and children. *Pediatr Neonatol*. 2020;61(2):131-2. DOI: 10.1016/j.pedneo.2020.03.001

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32199864>

DOI: 10.1016/j.pedneo.2020.03.001

33. Hua CZ, Miao ZP, Zheng JS, et al. Epidemiological features and viral shedding in children with SARS-CoV-2 infection. *J Med Virol*. 2020. DOI: 10.1002/jmv.26180

ABSTRACT: A pandemic of severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) infection broke out all over the world; however, epidemiological data and viral shedding in pediatric patients are limited. We conducted a retrospective, multicenter study, and followed-up with all children from the families with SARS-CoV-2 infected members in Zhejiang Province, China. All infections were confirmed by testing the SARS-CoV-2 RNA with real-time reverse transcription PCR method, and epidemiological data between children and adults in the same families were compared. Effect of antiviral therapy was evaluated observationally and fecal-viral excretion times among groups with different antiviral regimens were compared with Kaplan-Meier plot. By 29 February 2020, 1298 cases from 883 families were confirmed with SARS-CoV-2 infection and 314 of which were families with children. Incidence of infection in child close contacts was significantly lower than that in adult contacts (13.2% vs 21.2%). The mean age of 43 pediatric cases was 8.2 years and mean incubation period was

9.1 days. Forty (93.0%) were family clustering. Thirty-three children had coronavirus disease 2019 (20 pneumonia) with mild symptoms and 10 were asymptomatic. Fecal SARS-CoV-2 RNA detection was positive in 91.4% (32/35) cases and some children had viral excretion time over 70 days. Viral clearance time was not different among the groups treated with different antiviral regimens. No subsequent infection was observed in family contacts of fecal-viral-excreting children. Children have lower susceptibility of SARS-CoV-2 infection, longer incubation, and fecal-viral excretion time. Positive results of fecal SARS-CoV-2 RNA detection were not used as indication for hospitalization or quarantine.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32542750>

DOI: 10.1002/jmv.26180

34. Jeng MJ. Coronavirus disease 2019 in children: Current status. J Chin Med Assoc. 2020;83(6):527-33. DOI: 10.1097/JCMA.0000000000000323

ABSTRACT: Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), emerged from China in December 2019. The outbreak further exploded in Europe and America in mid-March 2020 to become a global health emergency. We reviewed recent published articles and on-line open messages on SARS-CoV-2-positive infants and children younger than 20 years of age. Symptoms are usually less severe in children than in adults. Twelve critically or mortally ill children were found in the published or news reports before April 6, 2020. Vertical transmission from the mother to her fetus or neonate has not been proven definitively. However, six early-onset (<7 days) and 3 late-onset neonatal SARS-CoV-2 infections were found in the literature. We also summarized the presentations and contact information of 24 SARS-CoV-2-positive children announced by the Taiwan Centers for Disease Control. Early identification and isolation, adequate management, prevention, and vaccine development are the keys to controlling the disease spread. Clinical physicians should be alert to asymptomatic children with COVID-19. Multidirectional investigations are crucial in the global fight against COVID-19.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32502117>

DOI: 10.1097/JCMA.0000000000000323

35. Kemelbekov K, Ospanova E, Baimakhanova B, et al. Epidemiological characteristics of new coronavirus diseases (COVID-19): Features of risk factors and clinical features of the child population. Electronic Journal of General Medicine. 2020;17 (6) (no pagination)(em252).

ABSTRACT: The article presents features of epidemiology and clinical picture of a new virus-COVID-2019 in Kazakhstan, features of dynamics among the child population. As of April 15, 2020, there are 1,295 cases of COVID-19. In total, the infection was confirmed in 80 children. Among them, one newborn, two children under one year old and this has allowed to limit the spread of this serious disease with the cooperation of all citizens in terms of containment and individual protection measures. Objective(s): to evaluate the prevalence, clinical and epidemiological features and risk factors of COVID-19 in children of different ages. The design of the study corresponded to the observational analytical one. The COVID-19 pandemic has spread very quickly, so it is children of all ages who should be the focus of special attention, as they play a huge role in the spread of the disease. Copyright © 2020, by Author/s and Licensed by Modestum Ltd., UK.

URL: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexb&AN=2004452023>

36. Kh EA. COVID-19 in children: Epidemiology, presentation, diagnosis and management. Journal of the Pakistan Medical Association. 2020;70(5):S108-S12.

ABSTRACT: The new pandemic coronavirus disease (COVID-19) has affected children, including neonates, who mostly comprise of approximately 2% of total confirmed cases. Most children are asymptomatic or have mild disease and much lower mortality compared to adults for yet unknown reasons. Recovery from illness has largely been universal and <2% have severe disease requiring intensive care. Standardised guidelines from initial studies are now available for diagnosis, treatment, and prevention. Treatment is mostly supportive with no recommendations for any specific drugs so far. As the pandemic evolves, it is expected that more children will

be diagnosed and treated with evolving newer regimens. Research should now focus on early diagnosis, better drugs for children, intensive care modalities, and a universal vaccine. New developments will help in better prevention besides from the other precautionary measures already being practiced. Copyright © 2020 Pakistan Medical Association. All rights reserved.

URL: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexb&AN=2006928410>

37. Khoshnevisasl P, Sadeghzadeh M, Sadeghzadeh S. A Review of COVID-19 in Children. Journal of Comprehensive Pediatrics. 2020;In Press(In Press):e103780. DOI: 10.5812/compreped.103780

URL: <https://sites.kowsarpub.com/jcp/articles/103780.html>

DOI: 10.5812/compreped.103780

38. KİLİÇAslan Ö, Sav N, EriŞEn Karaca S, et al. COVID-19 Disease in Children: Clinical Course, Diagnosis and Treatment Overview and Literature Data Compilation. Konuralp Tıp Dergisi. 2020;12(2):316-25. DOI: 10.18521/ktd.722266

ABSTRACT: The novel Coronavirus is named as SARS-CoV-2 is a highly contagious infection agent compared to the previous human coronaviruses. Each previous outbreak had distinctive danger. The high potential of infectiousness is the primary danger of novel coronavirus. While MERS-CoV infection is known to have higher mortality rate, SARS-CoV-2 has spread to many people all over the world in a concise time. SARS-CoV-2 (like SARS-CoV and MERS) infects fewer children and results in milder clinical symptoms than in adults. The primary pathogenesis of it is not known; the difference in children's immunities, less likelihood of exposure to the agent may be the reasons. Nevertheless, along with being mostly asymptomatic, the child population is a potential source for infection spread

URL: <http://www.konuralptipdergi.duzce.edu.tr/Dokumanlar/konuralptipdergi/sayi12-2/say%C4%B112-20.pdf>

DOI: 10.18521/ktd.722266

39. Korkmaz MF, Ture E, Dorum BA, et al. The Epidemiological and Clinical Characteristics of 81 Children with COVID-19 in a Pandemic Hospital in Turkey: an Observational Cohort Study. J Korean Med Sci. 2020;35(25):e236. DOI: 10.3346/jkms.2020.35.e236

ABSTRACT: BACKGROUND: Coronavirus disease-2019 (COVID-19) pandemic has affected millions of people throughout the world since December 2019. However, there is a limited amount of data about pediatric patients infected with the disease agent, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). METHODS: The epidemiological, laboratory, radiological, and treatment features of the pediatric patients who were positive for SARS-CoV-2 based on the reverse-transcription polymerase chain reaction (RT-PCR) test, were investigated retrospectively. RESULTS: The median age of 81 children included in the study was 9.50 years (0-17.75 years). The most frequent symptoms at the time of admission were fever (58%), cough (52%), and fatigue or myalgia (19%). The abnormal laboratory findings in these cases were decreased lymphocytes (2.5%, n = 2), leucopenia (5%, n = 4), and increased lactate dehydrogenase (17.2%, n = 14), C-reactive protein (16%, n = 13), procalcitonin (3.7%, n = 3), and D-dimer (12.3%, n = 10). Three (4%) patients had consolidation in chest computed tomography, and three (4%) had ground-glass opacities. None of the patients needed intensive care except for the newborns. The median time to turn SARS-CoV-2 negative in the RT-PCR test was 5 (3-10) days. The median length of hospital stay was 5 (4-10) days. The time to turn SARS-CoV-2 negative in the RT-PCR test and the length of hospital stay were significantly longer for those aged five years or younger than others (P = 0.037, P = 0.01). CONCLUSION: Compared to adults, COVID-19 is milder and more distinctive in children. As a result, more conservative approaches might be preferred in children for the diagnostic, clinical, and even therapeutic applications.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32597047>

DOI: 10.3346/jkms.2020.35.e236

40. Lechien JR, Chiesa-Estomba CM, Place S, et al. Clinical and epidemiological characteristics of 1420 European patients with mild-to-moderate coronavirus disease 2019. J Intern Med. 2020. DOI: 10.1111/joim.13089

ABSTRACT: BACKGROUND: The clinical presentation of European patients with mild-to-moderate COVID-19 infection is still unknown. OBJECTIVE: To study the clinical presentation of COVID-19 in Europe. METHODS: Patients with positive diagnosis of COVID-19 were recruited from 18 European hospitals. Epidemiological and clinical data were obtained through a standardized questionnaire. Bayesian analysis was used for analysing the relationship between outcomes. RESULTS: A total of 1,420 patients completed the study (962 females, 30.7% of healthcare workers). The mean age of patients was 39.17 +/- 12.09 years. The most common symptoms were headache (70.3%), loss of smell (70.2%), nasal obstruction (67.8%), cough (63.2%), asthenia (63.3%), myalgia (62.5%), rhinorrhea (60.1%), gustatory dysfunction (54.2%) and sore throat (52.9%). Fever was reported by 45.4%. The mean duration of COVID-19 symptoms of mild-to-moderate cured patients was 11.5 +/- 5.7 days. The prevalence of symptoms significantly varied according to age and sex. Young patients more frequently had ear, nose and throat complaints, whereas elderly individuals often presented fever, fatigue and loss of appetite. Loss of smell, headache, nasal obstruction and fatigue were more prevalent in female patients. The loss of smell was a key symptom of mild-to-moderate COVID-19 patients and was not associated with nasal obstruction and rhinorrhea. Loss of smell persisted at least 7 days after the disease in 37.5% of cured patients. CONCLUSION: The clinical presentation of mild-to-moderate COVID-19 substantially varies according to the age and the sex characteristics of patients. Olfactory dysfunction seems to be an important underestimated symptom of mild-to-moderate COVID-19 that needs to be recognized as such by the WHO.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32352202>

DOI: 10.1111/joim.13089

41. Leung C. Clinical characteristics of COVID-19 in children: Are they similar to those of SARS? Pediatr Pulmonol. 2020;55(7):1592-7. DOI: 10.1002/ppul.24855

ABSTRACT: Although the number of SARS-CoV-2 infections has been rising amid the current pandemic of COVID-19, the low infection rate of SARS-CoV-2 in children has been low. By examining the clinical data available in the public domain, the present work clarifies the clinical presentations in children with COVID-19 in China. Statistical significance tests and adjusted odds ratios estimation were performed on the children (age below 18) and adults (age 18 or above) cohorts in China. SARS-CoV and SARS-CoV-2 shared similar clinical features. Lower respiratory tract infection was less prominent in children as evidenced by the relatively low prevalence in chest pain/discomfort and dyspnea. Similar to SARS, younger children had a less aggressive clinical course, compared with adolescents. While fewer symptoms were observed in children compared to adults, there is not yet sufficient evidence to conclude shorter hospital stay in children.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32437077>

DOI: 10.1002/ppul.24855

42. Li B, Shen J, Li L, et al. Radiographic and Clinical Features of Children With Coronavirus Disease (COVID-19) Pneumonia. Indian pediatrics. 2020;57(5):423-6.

ABSTRACT: OBJECTIVE: The purpose of this study was to investigate chest computed tomography (CT) findings in children with coronavirus disease-19 (COVID-19) pneumonia in our hospital. METHODS: This study included 22 pediatric patients with confirmed COVID-19 from January to March, 2020. The chest CT images and clinical data were reviewed. RESULTS: The most prevalent presenting symptoms were fever (64%) and cough (59%), and a mildly elevated mean (SD) C-reactive protein (CRP) level of 11.22(11.06) and erythrocyte sedimentation rate of 18.8(15.17) were detected. The major CT abnormalities observed were mixed ground-glass opacity and consolidation lesions (36%), consolidations (32%), and ground-glass opacities (14%). Peripheral distribution (45%) of lung lesions was predominant. Most of the lesions were multilobar(68%), with an average of three lung segments involved. CONCLUSIONS: Children with COVID-19 had relatively milder symptoms and less severe lung

inflammation than adults. Chest CT plays an important role in the management of children with COVID-19 pneumonia.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32255437>

43. Li Y, Cao J, Zhang X, et al. Chest CT imaging characteristics of COVID-19 pneumonia in preschool children: a retrospective study. BMC Pediatr. 2020;20(1):227. DOI: 10.1186/s12887-020-02140-7

ABSTRACT: BACKGROUND: Recently, the World Health Organization has declared the coronavirus disease 2019 (COVID-19) outbreak a public health emergency of international concern. So far, however, limited data are available for children. Therefore, we aimed to investigate the clinical and chest CT imaging characteristics of COVID-19 in preschool children. METHODS: From January 26, 2020 to February 20, 2020, the clinical and initial chest CT imaging data of eight preschool children with laboratory-confirmed COVID-19 from two hospitals were retrospectively collected. The chest CT imaging characteristics, including the distribution, shape, and density of lesions, and the pleural effusion, pleural changes, and enlarged lymph nodes were evaluated. RESULTS: Two cases (25%) were classified as mild type, and they showed no obvious abnormal CT findings or minimal pleural thickening on the right side. Five cases (62.5%) were classified as moderate type. Among these patients, one case showed consolidation located in the subpleural region of the right upper lobe, with thickening in the adjacent pleura; one case showed multiple consolidation and ground-glass opacities with blurry margins; one case displayed bronchial pneumonia-like changes in the left upper lobe; and two cases displayed asthmatic bronchitis-like changes. One case (12.5%) was classified as critical type and showed bronchial pneumonia-like changes in the bilateral lungs, presenting blurred and messy bilateral lung markings and multiple patchy shadows scattered along the lung markings with blurry margins. CONCLUSIONS: The chest CT findings of COVID-19 in preschool children are atypical and various. Accurate diagnosis requires a comprehensive evaluation of epidemiological, clinical, laboratory and CT imaging data.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32423435>

DOI: 10.1186/s12887-020-02140-7

44. Liao J, Fan S, Chen J, et al. Epidemiological and Clinical Characteristics of COVID-19 in Adolescents and Young Adults. The Innovation. 2020;1(1). DOI: 10.1016/j.xinn.2020.04.001

ABSTRACT: BACKGROUND Adolescents and young adults might play a key role in the worldwide spread of Coronavirus Disease 2019 (COVID-19) because they are more likely to be involved in overseas study, business, work, and travel. However, the epidemiological and clinical characteristics remain unknown. METHODS We collected demographic, epidemiological, and clinical data from 46 confirmed COVID-19 patients aged 10 to 35 years from the Chongqing Three Gorges Central Hospital. Several key epidemiological parameters, asymptomatic cases, transmission to family members, and clinical characteristics at admission and during treatment were summarized. RESULTS Of 46 confirmed patients, 14 patients (30.4%) were aged between 10 and 24 years, and 24 (52.2%) patients were male. The estimated mean incubation period was 6.6 days (95% confidence interval [CI] 4.4–9.6). The median serial interval was 1.9 days (95% CI 0.4–6.2). Three of the asymptomatic cases showed transmission to their family members. Only one patient was identified as a severe case at admission. The common symptoms at admission were dry cough (34, 81.0%) and fever (29, 69.1%). Nearly 60% of the patients showed ground-glass opacity on chest computed tomography. Three patients developed acute kidney injury during treatment. Most of the patients (78.3%) recovered and were discharged by the end of the follow-up. CONCLUSIONS This single-center study with a relatively small sample size showed that adolescent and young adult patients with COVID-19 had a long incubation period and a short serial interval. The transmission occurred from asymptomatic cases to family members. Fewer patients developed complications during treatment.

URL: [https://www.cell.com/the-innovation/pdfExtended/S2666-6758\(20\)30001-1](https://www.cell.com/the-innovation/pdfExtended/S2666-6758(20)30001-1)

DOI: 10.1016/j.xinn.2020.04.001

45. Liguoro I, Pilotto C, Bonanni M, et al. SARS-COV-2 infection in children and newborns: a systematic review. Eur J Pediatr. 2020;179(7):1029-46. DOI: 10.1007/s00431-020-03684-7

ABSTRACT: A recent outbreak of a novel Coronavirus responsible for a Severe Acute Respiratory Syndrome (SARS-CoV-2) is spreading globally. The aim of this study was to systematically review main clinical characteristics and outcomes of SARS-CoV-2 infections in pediatric age. An electronic search was conducted in PubMed database. Papers published between 1 January and 1 May 2020 including children aged 0-18 years were selected. Sixty-two studies and three reviews were included, with a total sample size of 7480 children (2428/4660 males, 52.1%; weighted mean age 7.6 years). Patients showed mainly mild (608/1432, 42.5%) and moderate (567/1432, 39.6%) signs of the infection. About 2% of children were admitted to the pediatric intensive care unit. The most commonly described symptoms were fever (51.6%) and cough (47.3%). Laboratory findings were often unremarkable. Children underwent a chest CT scan in 73.9% of all cases, and 32.7% resulted normal. Overall, the estimated mortality was 0.08%. A higher proportion of newborns was severely ill (12%) and dyspnea was the most common reported sign (40%). Conclusion: SARS-CoV-2 affects children less severely than adults. Laboratory and radiology findings are mainly nonspecific. Larger epidemiological and clinical cohort studies are needed to better understand possible implications of COVID-19 infection in children. What is Known: * A novel Coronavirus has been recently identified as responsible for a new Severe Acute Respiratory Syndrome (SARS-CoV-2) spreading globally. * There is limited evidence on SARS-CoV2 infection in children. What is New: * Systematically reviewed available evidence showed that children with SARS-CoV-2 infection may have a less severe pattern of disease in comparison to adults. * Blood tests and radiology findings are mainly nonspecific in children but may help to identify those who are severely ill.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32424745>

DOI: 10.1007/s00431-020-03684-7

46. Lu Y, Li Y, Deng W, et al. Symptomatic Infection is Associated with Prolonged Duration of Viral Shedding in Mild Coronavirus Disease 2019: A Retrospective Study of 110 Children in Wuhan. The Pediatric infectious disease journal. 2020;39(7):e95-e9. DOI: 10.1097/INF.0000000000002729

ABSTRACT: BACKGROUND: Information regarding viral shedding in children with coronavirus disease 2019 (COVID-19) was limited. This study aims to investigate the clinical and laboratory characteristics associated with viral shedding in children with mild COVID-19. METHODS: The clinical and laboratory information of 110 children with COVID-19 at Wuhan Children's Hospital, Wuhan, China, from January 30 to March 10, 2020, were analyzed retrospectively. RESULTS: The median age was 6 years old. The median period of viral shedding of COVID-19 was 15 days (interquartile range [IQR], 11-20 days) as measured from illness onset to discharge. This period was shorter in asymptomatic patients (26.4%) compared with symptomatic patients (73.6%) (11 days vs. 17 days). Multivariable regression analysis showed increased odds of symptomatic infection was associated with age <6 years (odds ratio [OR] 8.94, 95% confidence interval [CI]: 2.55-31.35; P = 0.001), hypersensitive C-reactive protein >3.0 mg/L (OR 4.89; 95% CI: 1.10-21.75; P = 0.037) and presenting pneumonia in chest radiologic findings (OR 8.45; 95% CI: 2.69-26.61; P < 0.001). Kaplan-Meier analysis displayed symptomatic infection (P < 0.001), fever (P = 0.006), pneumonia (P = 0.003) and lymphocyte counts <2.0 x 10/L (P = 0.008) in children with COVID-19 were associated with prolonged duration of viral shedding in children with COVID-19. CONCLUSION: Prolonged duration of viral shedding in children with COVID-19 was associated with symptomatic infection, fever, pneumonia and lymphocyte count less than 2.0 x 10/L. Monitoring of symptoms could help to know the viral shedding in children with COVID-19.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32379191>

DOI: 10.1097/INF.0000000000002729

47. Lu Y, Wen H, Rong D, et al. Clinical characteristics and radiological features of children infected with the 2019 novel coronavirus. Clin Radiol. 2020;75(7):520-5. DOI: 10.1016/j.crad.2020.04.010

ABSTRACT: AIM: To identify and summarise the common findings from 2019 novel coronavirus (2019-nCoV) infections in children. MATERIALS AND METHODS: The clinical characteristics and radiological findings (chest

radiography and chest computed tomography [CT]) of nine children infected with the 2019-nCoV were reviewed in this retrospective case series. RESULTS: Among the children, six had fever (including two children with cough), one had only cough, one had a stuffy nose when initially diagnosed, and one was an asymptomatic carrier. Chest radiographs seemed mostly normal in six cases whereas increased and/or disordered bilateral bronchovascular shadows and dense hilar shadows were seen in three cases. Chest CT exhibited no obvious abnormal signs in four cases. Typical CT findings included patchy, peripheral ground-glass opacities, subpleural lamellar dense shadows, and parenchymal bands. Pleural effusions, mediastinal lymphadenopathy, cavitation, and pleural thickening were absent. CONCLUSION: The clinical manifestations and radiological findings of the 2019-nCoV-infected children were mild and lacked a typical pattern.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32389373>

DOI: 10.1016/j.crad.2020.04.010

48. Ludvigsson JF. Systematic review of COVID-19 in children shows milder cases and a better prognosis than adults. *Acta Paediatr.* 2020;109(6):1088-95. DOI: 10.1111/apa.15270

ABSTRACT: AIM: The coronavirus disease 2019 (COVID-19) pandemic has affected hundreds of thousands of people. Data on symptoms and prognosis in children are rare. METHODS: A systematic literature review was carried out to identify papers on COVID-19, which is caused by the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), using the MEDLINE and Embase databases between January 1 and March 18, 2020. RESULTS: The search identified 45 relevant scientific papers and letters. The review showed that children have so far accounted for 1%-5% of diagnosed COVID-19 cases, they often have milder disease than adults and deaths have been extremely rare. Diagnostic findings have been similar to adults, with fever and respiratory symptoms being prevalent, but fewer children seem to have developed severe pneumonia. Elevated inflammatory markers were less common in children, and lymphocytopenia seemed rare. Newborn infants have developed symptomatic COVID-19, but evidence of vertical intrauterine transmission was scarce. Suggested treatment included providing oxygen, inhalations, nutritional support and maintaining fluids and electrolyte balances. CONCLUSIONS: The coronavirus disease 2019 has occurred in children, but they seemed to have a milder disease course and better prognosis than adults. Deaths were extremely rare.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32202343>

DOI: 10.1111/apa.15270

49. Ma X, Liu S, Chen L, et al. The clinical characteristics of pediatric inpatients with SARS-CoV-2 infection: A meta-analysis and systematic review. *J Med Virol.* 2020. DOI: 10.1002/jmv.26208

ABSTRACT: Millions of people were infected with the coronavirus disease 2019 (COVID-19) all over the world. Data on clinical symptoms of pediatric inpatients with COVID-19 infection were unclear. The aim of study was to investigate the clinical features of pediatric inpatients with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection. PubMed, EMBASE, and the Cochrane Library were searched to seek for studies providing details on pediatric inpatients with SARS-CoV-2 infection which were published from 1st January to 21st April 2020. Studies with more than five pediatric inpatients were included in our meta-analysis. This study was registered in the PROSPERO database (CRD42020183550). As the results shown, fever (46%) and cough (42%) were the main clinical characters of pediatric inpatients with SARS-CoV-2 infection and the other clinical characters, such as diarrhea, vomiting, nasal congestion, and fatigue account for 10% in pediatric inpatients. The proportion of asymptomatic cases was 0.42 (95% confidence interval [CI]: 0.27-0.59) and severe cases was 0.03 (95% CI: 0.01-0.06). For the laboratory result, leukopenia (21%) and lymphocytosis (22%) were the mainly indicators for pediatric inpatients, followed by high aspartate aminotransferase (19%), lymphopenia (16%), high alanine aminotransferase (15%), high C-reactive protein (17%), leukocytosis (13%), high D-dimer (12%) and high creatine kinase-MB (5%). Regard to chest imaging features, unilateral and bilateral accounts for 22% in pediatric inpatients, respectively. In conclusion, compared with adult inpatients with SARS-CoV-2 infection, the pediatric inpatients had mild clinical characters, lab test indicators, and chest imaging features. More clinical studies focus on the pediatric patients with SARS-CoV-2 infection in other countries should be conducted.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32558955>

DOI: 10.1002/jmv.26208

50. Mannheim J, Gretsch S, Layden JE, et al. Characteristics of Hospitalized Pediatric COVID-19 Cases - Chicago, Illinois, March - April 2020. J Pediatric Infect Dis Soc. 2020;01. DOI: 10.1093/jpids/piaa070

ABSTRACT: BACKGROUND: To date, no report on COVID-19 pediatric patients in a large urban center with data on underlying comorbidities and co-infection for hospitalized cases has been published. METHODS: Case series of Chicago COVID-19 patients aged 0-17 years reported to Chicago Department of Public Health (CDPH) from 3/5/20-4/8/20. Enhanced case investigation performed. Chi-square and Wilcoxon two-sample tests to compare characteristics among hospitalized and non-hospitalized cases. RESULTS: During March 5-April 8, 2020, 6369 lab-confirmed cases of COVID-19 were reported to CDPH; 64 (1.0%) were among children 0-17 years. Ten patients (16%) were hospitalized, seven (70%) required intensive care (ICU); median length of hospitalization 4 days (range: 1-14). Reported fever and dyspnea were significantly higher in hospitalized patients compared to non-hospitalized patients (9/10 vs. 28/54, $p = 0.04$ and 7/10 vs. 10/54, $p = 0.002$, respectively). Hospitalized patients were significantly younger than non-hospitalized patients (median, 3.5 years vs. 12 years; $p = 0.03$) and all either had an underlying comorbidity or co-infection. Among the 34 unique households with multiple laboratory-confirmed infections, median number of laboratory-confirmed infections was 2 (range: 2-5), and 31 (91%) households had at least one COVID-19 infected adult. For 15 households with available data to assess transmission, 11 (73%) were adult-to-child, 2 (13%) child-to-child, and 2 (13%) child-to-adult. CONCLUSIONS: Enhanced case investigation of hospitalized patients revealed that underlying comorbidities and co-infection might have contributed to severe disease. Given frequency of household transmission, healthcare providers should consider alternative dispositional planning for affected families of children living with comorbidities.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32479632>

DOI: 10.1093/jpids/piaa070

51. Mantovani A, Rinaldi E, Zusi C, et al. Coronavirus disease 2019 (COVID-19) in children and/or adolescents: a meta-analysis. Pediatric research. 2020. DOI: 10.1038/s41390-020-1015-2

ABSTRACT: BACKGROUND: To assess the overall prevalence of clinical signs, symptoms, and radiological findings in children and/or adolescents with COVID-19. METHODS: We systematically researched in PubMed, Scopus and Web of Science databases observational studies describing COVID-19 in children and/or adolescents until April 11, 2020. Data regarding clinical and radiological features were extracted from eligible studies and meta-analysis was performed using random-effects modeling. RESULTS: We examined 19 eligible studies for a total of 2855 children and/or adolescents with COVID-19. Approximately 47% of subjects had fever (95% confidence interval [CI] 22-72%; $I(2) = 98.6%$), 37% cough (95%CI 15-63%; $I(2) = 98.6%$), 4% diarrhea (95%CI 0-12%; $I(2) = 92.2%$), 2% nasal congestion (95%CI 0-7%; $I(2) = 87.7%$), 1% dyspnea (95%CI 0-7%; $I(2) = 91.5%$) and 0% abdominal pain (95%CI 0-1%; $I(2) = 76.3%$). Subjects presented mild symptoms in 79% (95%CI 65-91%; $I(2) = 93.5%$) of cases, whereas only 4% (95%CI 1-9%; $I(2) = 76.4%$) were critical. Among those with pneumonia on computed tomography, 26.4% (95%CI 13-41%; $I(2) = 80.8%$) presented a unilateral involvement, 16% (95%CI 5-29%, $I(2) = 81.2%$) had bilateral involvement and 9% (95%CI 0-24%; $I(2) = 88.7%$) had interstitial pneumonia. CONCLUSIONS: Children and/or adolescents tend to have a mild COVID-19 course with a good prognosis. IMPACT: Compared to adults, children and/or adolescents tend to have a mild COVID-19 course with a good prognosis. This study provides new and consistence information on the clinical and radiological characteristics of COVID-19 in pediatrics. This study may help to fight COVID-19 in pediatric population.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32555539>

DOI: 10.1038/s41390-020-1015-2

52. Mehta NS, Mytton OT, Mullins EWS, et al. SARS-CoV-2 (COVID-19): What do we know about children? A systematic review. Clinical infectious diseases : an official publication of the Infectious Diseases Society of America. 2020;11.

ABSTRACT: BACKGROUND: Few paediatric cases of COVID-19 have been reported and we know little about the epidemiology in children, though more is known about other coronaviruses. We aimed to understand the infection rate, clinical presentation, clinical outcomes and transmission dynamics for SARS-CoV-2, in order to inform clinical and public health measures. METHOD(S): We undertook a rapid systematic review and narrative synthesis of all literature relating to SARS-CoV-2 in paediatric populations. The search terms also included SARS-CoV and MERS-CoV. We searched three databases and the COVID-19 resource centres of eleven major journals and publishers. English abstracts of Chinese language papers were included. Data were extracted and narrative syntheses conducted. RESULT(S): 24 studies relating to COVID-19 were included in the review. Children appear to be less affected by COVID-19 than adults by observed rate of cases in large epidemiological studies. Limited data on attack rate indicate that children are just as susceptible to infection. Data on clinical outcomes are scarce but include several reports of asymptomatic infection and a milder course of disease in young children, though radiological abnormalities are noted. Severe cases are not reported in detail and there are little data relating to transmission. CONCLUSION(S): Children appear to have a low observed case rate of COVID-19 but may have similar rates to adults of infection with SARS-CoV-2. This discrepancy may be because children are asymptomatic or too mildly infected to draw medical attention, be tested and counted in observed cases of COVID-19. Copyright © The Author(s) 2020. Published by Oxford University Press for the Infectious Diseases Society of America.

URL: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexb&AN=631736675>

53. Menon PR. Pediatric Coronavirus Disease-19 (COVID-19): Meta-analyzing Literature Versus Natural History. Indian pediatrics. 2020.

ABSTRACT: We read with interest the recent systematic review on clinical features and outcome of Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) infection in children [1]. However, a major deficiency in the strategy seems to be the omission of Pediatric multisystem inflammatory syndrome (PMIS) [2]. Thus, the natural history of coronavirus disease 19 (COVID-19) in children seems innocuous. An early narrative review in the journal [3] observed that the mortality due to COVID-19 in children is rare, with majority being asymptomatic or having mild respiratory and gastrointestinal manifestations. The present systematic review [1] also substantiates that most children with COVID19 were asymptomatic; amongst symptomatic children, only 0.7% required mechanical ventilation. The unique delayed cardiovascular manifestations in children have been omitted altogether from the suggested screening strategy for SARS-CoV infection.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32710533>

54. Minotti C, Tirelli F, Barbieri E, et al. How is immunosuppressive status affecting children and adults in SARS-CoV-2 infection? A systematic review. J Infect. 2020;81(1):e61-e6. DOI: 10.1016/j.jinf.2020.04.026

ABSTRACT: OBJECTIVES: SARS-CoV-2 infection has now a global resonance. Data on how COVID-19 is affecting immunocompromised patients are however few. With our study we aimed to systematically review the current knowledge on SARS-CoV-2 cases in children and adults with immunosuppression, to evaluate outcomes in this special population. METHODS: A systematic review of literature was carried out to identify relevant articles, searching the EMBASE, Medline, and Google Scholar databases. Studies reporting data on pre-defined outcomes and related to immunosuppressed adults and children with SARS-CoV-2 were included. RESULTS: Sixteen relevant articles were identified with 110 immunosuppressed patients, mostly presenting cancer, along with transplantation and immunodeficiency. Cancer was more often associated with a more severe course, but not necessarily with a bad prognosis. Our data show that both children and adults with immunosuppression seem to have a favorable disease course, as compared to the general population. CONCLUSION: Immunosuppressed patients with COVID-19 seem to be few in relation to the overall figures, and to present a favorable outcome as compared to other comorbidities. This might be explained by a hypothetical protective role of a weaker immune response, determining a milder disease presentation and thus underdiagnosis. Nevertheless, surveillance on this special population should be encouraged.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32335173>

DOI: 10.1016/j.jinf.2020.04.026

55. Mon EY, Mandelia Y. Managing COVID-19 disease in pediatric patients. Cleve Clin J Med. 2020. DOI: 10.3949/ccjm.87a.ccc022

ABSTRACT: Children are less likely to be infected with SARS-CoV-2 than adults and often have a milder course of COVID-19 disease and a lower case fatality rate. Children account for an estimated 1% to 5% of those diagnosed with COVID-19. Even so, preschool-aged children, infants, and children with underlying health conditions may still be at risk for severe disease and complications. Unique aspects of COVID-19 presentation and disease course in children and possible vertical transmission to newborns from COVID-19-positive mothers are discussed.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32393595>

DOI: 10.3949/ccjm.87a.ccc022

56. Moreno-Galarraga L, Taveras EM. COVID-19 disease in children: not as mild as we have been led to believe. World J Pediatr. 2020;16(4):426-7. DOI: 10.1007/s12519-020-00380-2

ABSTRACT: Since severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) emerged, we have followed this pandemic with great interest and concern from Europe (Navarra-Spain) and the United States (Boston-Massachusetts). We were expecting children to present to emergency departments with the “classical COVID-19 symptoms-triad” such as fever, cough, and a range of respiratory distress [1] and we had learned from countries affected earlier by the virus, that it appeared to be less common and relatively mild in children [2, 3]. However, in April 2020, pediatricians from different European countries and the United States began reporting cases of COVID-19 in children, requiring intensive care unit treatment and associating severe cardiac-symptoms, generally presenting 3–5 weeks after the COVID-19 peak. We have learned how children can present with a wide range of clinical symptoms, with respiratory symptoms not always being present and how some previously healthy children can present with skin-lesions, hypotension and tachycardia developing in the next hours an acute cardiac failure (with elevated cardiac-enzymes and imagine-compatible findings with acute-myocarditis).

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32578007>

DOI: 10.1007/s12519-020-00380-2

57. Mustafa NM, L AS. Characterisation of COVID-19 Pandemic in Paediatric Age Group: A Systematic Review and Meta-Analysis. J Clin Virol. 2020;128:104395. DOI: 10.1016/j.jcv.2020.104395

ABSTRACT: BACKGROUND: Coronavirus disease 2019 (COVID-19) is a pandemic first originated in Wuhan the capital of Hubei province, China in December 2019 and then spread globally. It is caused by SARS-CoV-2. Until 1(st) April 2020, the number of cases worldwide was recorded to be 823,626 with 40,598 deaths. Most of the reported cases were adults with few cases described in children and neonates. OBJECTIVES: We performed a systematic review and meta-analysis to analyse the disease characterisation in paediatric age group including the possibility of vertical transmission to the neonates. METHODS: Articles published up to 2(nd) April 2020 in PubMed and google Scholar were considered for this study. FINDINGS: The most frequently reported symptoms were cough 49% (95% CI: 42 - 55%) and fever 47% (95% CI: 41- 53%). Lymphopenia and increased Procalcitonin were recorded in (21%, 95% CI: 12 - 30%) and (28%, 95% CI: 18 - 37%) respectively. No sex difference for COVID-19 was found in paediatric age group ($p=0.7$). Case fatality rate was 0%. Four out of 58 neonates (6.8%) born to COVID-19 confirmed mothers tested positive for the disease. CONCLUSION: The disease trajectory in Paediatric patients has good prognosis compared to adults. Intensive care unit and death are rare. Vertical transmission and virus shedding in breast milk are yet to be established.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32417675>

DOI: 10.1016/j.jcv.2020.104395

58. Ng KF, Bandi S, Bird PW, et al. COVID-19 in Neonates and Infants: Progression and Recovery. The Pediatric infectious disease journal. 2020;39(7):e140-e2. DOI: 10.1097/INF.0000000000002738

ABSTRACT: Between March 10, 2020 and April 17, 2020, of 8/70 (11.4%) SARS-CoV-2 positive infants that presented, 5/8 (63%) developed fever, 4/8 (50%) had lower respiratory tract involvement, 2/8 (25%) had neutropenia and thrombocytosis, and 4/8 infants (50%) were treated for suspected sepsis with broad-spectrum antibiotics. Only 1/8 (13%) required pediatric intensive care. All patients were eventually discharged home well.
URL: <https://www.ncbi.nlm.nih.gov/pubmed/32384398>
DOI: 10.1097/INF.0000000000002738

59. Otto WR, Geoghegan S, Posch LC, et al. The Epidemiology of SARS-CoV-2 in a Pediatric Healthcare Network in the United States. J Pediatric Infect Dis Soc. 2020;19. DOI: 10.1093/jpids/piaa074

ABSTRACT: BACKGROUND: Understanding the prevalence and clinical presentation of COVID-19 in pediatric patients can help healthcare providers and systems prepare and respond to this emerging pandemic. METHODS: Retrospective case series of patients tested for SARS-CoV-2 across a pediatric healthcare network, including the clinical features and outcomes of those with positive test results. RESULTS: Of 7,256 unique children tested for SARS-CoV-2, 424 (5.8%) tested positive. Patients 18-21 years of age had the highest test positive rate (11.2%) while those 1-5 years of age had the lowest (3.9%). By race, 10.6% (226/2132) of Black children tested positive vs. 3.3% (117/3592) of White children. Of those with an indication for testing, 21.1% (371/1756) of patients with reported exposures or clinical symptoms tested positive vs. 3.8% (53/1410) of those undergoing pre-procedural or pre-admission testing. Of the 424 patients who tested positive for SARS-CoV-2, 182 (42.9%) had no comorbid medical conditions, 87 (20.5%) had asthma, 55 (13.0%) had obesity, and 38 (9.0%) had mental health disorders. Overall, 52.1% had cough, 51.2% fever, and 14.6% shortness of breath. Seventy-seven (18.2%) SARS-CoV-2 positive patients were hospitalized, of which 24 (31.2%) required any respiratory support. SARS-CoV-2-targeted antiviral therapy was given to 9 patients, and immunomodulatory therapy to 18 patients. Twelve (2.8%) SARS-CoV-2 positive patients developed critical illness requiring mechanical ventilation and 2 patients required extracorporeal membrane oxygenation. Two patients died. CONCLUSIONS: In this large cohort of pediatric patients tested for SARS-CoV-2, the rate of infection was low, but varied by testing indication. The majority of cases were mild, few children had critical illness, and two patients died.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32559282>
DOI: 10.1093/jpids/piaa074

60. Oualha M, Bendavid M, Berteloot L, et al. Severe and fatal forms of COVID-19 in children. Arch Pediatr. 2020;27(5):235-8. DOI: 10.1016/j.arcped.2020.05.010

ABSTRACT: OBJECTIVES: The aim of this study was to describe severe forms of novel coronavirus disease 2019 in children, including patient characteristics, clinical, laboratory, and imaging findings, as well as the disease management and outcomes. METHODS: This was a retrospective, single-center, observational study conducted in a pediatric intensive and high-dependency care unit (PICU, HDU) in an urban hospital in Paris. All patients, aged from 1 month to 18 years, admitted for confirmed or highly suspected SARS-CoV-2 were included. RESULTS: We analyzed the data of 27 children. Comorbidities (n=19, 70%) were mainly neurological (n=7), respiratory, (n=4), or sickle cell disease (n=4). SARS-CoV-2 PCR results were positive in 24 children (nasopharyngeal swabs). The three remaining children had a chest CT scan consistent with COVID-19. Respiratory involvement was observed in 24 patients (89%). Supportive treatments were invasive mechanical ventilation (n=9), catecholamine (n=4), erythropoiesis (n=4), renal replacement therapy (n=1), and extracorporeal membrane oxygenation (n=1). Five children died, of whom three were without past medical history. CONCLUSION: This study highlighted the large spectrum of clinical presentation and time course of disease progression as well as the non-negligible occurrence of pediatric life-threatening and fatal cases of COVID-19 mostly in patients with comorbidities. Additional laboratory investigations are needed to further analyze the mechanism underlying the variability of SARS-Cov-2 pathogenicity in children.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32518045>
DOI: 10.1016/j.arcped.2020.05.010

61. Pandit KGSSAG. Clinico-Pathogenesis of COVID-19 in children. Indian Journal of Biochemistry & Biophysics. 2020;57:264-9.

ABSTRACT: The recent pandemic by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) causing Coronavirus disease 2019 (COVID-19) affects mainly adults and to a lesser extent children. The major route of spread is via droplets where the virus is released into the air in the form of droplets by an infected individual during coughing and sneezing. The virus primarily infects the respiratory tract epithelium. Its spike protein interacts via ACE-2 receptor and facilitates the entry of the virus into the cells by membrane fusion. The activated Cytotoxic T cells and other cells cause an exaggerated inflammatory response releasing huge amounts of pro-inflammatory cytokines like interleukins and interferon. Due to this surge in the cytokine levels leading to a storm like state, there is significant endothelial injury causing hyper-coagulable state and disseminated intravascular coagulation. The common presentation in children include involvement of respiratory system leading to pneumonia, severe pneumonia, acute respiratory distress syndrome and rarely multiorgan involvement.

URL: <http://nopr.niscair.res.in/bitstream/123456789/54473/1/IJBB%2057%283%29%20264-269.pdf>

62. Parri N, Magista AM, Marchetti F, et al. Characteristic of COVID-19 infection in pediatric patients: early findings from two Italian Pediatric Research Networks. Eur J Pediatr. 2020;179(8):1315-23. DOI: 10.1007/s00431-020-03683-8

ABSTRACT: Detailed data on clinical presentations and outcomes of children with COVID-19 in Europe are still lacking. In this descriptive study, we report on 130 children with confirmed COVID-19 diagnosed by 28 centers (mostly hospitals), in 10 regions in Italy, during the first months of the pandemic. Among these, 67 (51.5%) had a relative with COVID-19 while 34 (26.2%) had comorbidities, with the most frequent being respiratory, cardiac, or neuromuscular chronic diseases. Overall, 98 (75.4%) had an asymptomatic or mild disease, 11 (8.5%) had moderate disease, 11 (8.5%) had a severe disease, and 9 (6.9%) had a critical presentation with infants below 6 months having significantly increased risk of critical disease severity (OR 5.6, 95% CI 1.3 to 29.1). Seventy-five (57.7%) children were hospitalized, 15 (11.5%) needed some respiratory support, and nine (6.9%) were treated in an intensive care unit. All recovered. **Conclusion:** This descriptive case series of children with COVID-19, mostly encompassing of cases enrolled at hospital level, suggest that COVID-19 may have a non-negligible rate of severe presentations in selected pediatric populations with a relatively high rates of comorbidities. More studies are needed to further understand the presentation and outcomes of children with COVID-19 in children with special needs. **What is Known:** * There is limited evidence on the clinical presentation and outcomes of children with COVID-19 in Europe, and almost no evidence on characteristics and risk factors of severe cases. **What is New:** * Among a case series of 130 children, mostly diagnosed at hospital level, and with a relatively high rate (26.2%) of comorbidities, about three-quarter had an asymptomatic or mild disease. * However, 57.7% were hospitalized, 11.5% needed some respiratory support, and 6.9% were treated in an intensive care unit.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32495147>

DOI: 10.1007/s00431-020-03683-8

63. Patel NA. Pediatric COVID-19: Systematic review of the literature. American journal of otolaryngology. 2020;41(5):102573. DOI: 10.1016/j.amjoto.2020.102573

ABSTRACT: **OBJECTIVES:** There is limited data regarding the demographics and clinical features of SARS-CoV-2 infection in children. This information is especially important as pneumonia is the single leading cause of death in children worldwide. This Systematic Review aims to elucidate a better understanding of the global impact of COVID-19 on the pediatric population. **METHODS:** A systematic review of the literature was performed in accordance with PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to gain insight into pediatric COVID-19 epidemiology. Specifically, Pubmed and Google Scholar databases were searched to identify any relevant article with a focus on Pediatric Covid 19, Pediatric Covid-19, Pediatric SARS-CoV-2, and Pediatric Coronavirus 19. References within the included articles were reviewed. All articles that met criteria were analyzed for demographics, clinical, laboratory, radiographic, treatment and outcomes data.

RESULTS: Ten studies including two case series and 8 retrospective chart reviews, altogether describing a total of 2914 pediatric patients with COVID-19 were included in this systematic review. Of the patients whose data was available, 56% were male, the age range was 1day to 17years, 79% were reported to have no comorbidities, and of the 21% with comorbidities, the most common were asthma, immunosuppression, and cardiovascular disease. Of pediatric patients that were tested and positive for an infection with SARS-CoV-2, patients were asymptomatic, 14.9% of the time. Patients presented with cough (48%), fever (47%) and sore throat/pharyngitis (28.6%), more commonly than with upper respiratory symptoms/rhinorrhea/sneezing/nasal congestion (13.7%), vomiting/nausea (7.8%) and diarrhea (10.1%). Median lab values including those for WBC, lymphocyte count and CRP, were within the reference ranges with the exception of procalcitonin levels, which were slightly elevated in children with COVID-19 (median procalcitonin levels ranged from 0.07 to 0.5ng/mL. Computed tomography (CT) results suggest that unilateral CT imaging findings are present 36% of cases while 64% of pediatric patients with COVID-19 had bilateral findings. Of the studies with age specific hospitalization data available, 27.0% of patients hospitalized were infants under 1year of age. Various treatment regimens including interferon, antivirals, and hydroxychloroquine therapies have been trialed on the pediatric population but there are currently no studies showing efficacy of one regimen over the other. The mortality rate of children that were hospitalized with COVID-19 was 0.0018%. **CONCLUSION:** In contrast to adults, most infected children appear to have a milder course and have better outcomes overall. Additional care may be needed for children with comorbidities and younger children. This review also suggests that unilateral CT chest imaging findings were seen in 36.4% pediatric COVID-19 patients. This is particularly concerning as the work-up of pediatric patients with cough may warrant a bronchoscopy to evaluate for airway foreign bodies. Extra precautions need to be taken with personal protective equipment for these cases, as aerosolizing procedures may be a method of viral transmission. **LEVEL OF EVIDENCE:** 4 (Systematic Review).

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32531620>

DOI: 10.1016/j.amjoto.2020.102573

64. Peng H, Gao P, Xu Q, et al. Coronavirus disease 2019 in children: Characteristics, antimicrobial treatment, and outcomes. J Clin Virol. 2020;128(104425):104425. DOI: 10.1016/j.jcv.2020.104425

ABSTRACT: **BACKGROUND:** At present, coronavirus disease 2019 (COVID-19) has spread in many countries. We conducted this study to help pediatricians understand the conditions of COVID-19 in children. **METHODS:** We retrospectively summarized the characteristics, treatment and outcomes of pediatric cases in Wuhan Children's Hospital which was the only designated hospital for children with COVID-19 in Hubei Province. A Cox proportional hazards regression analysis was used to evaluate factors associated with clinical outcomes. **RESULTS:** As of February 29, 75 children had been discharged, of which only one has severe pneumonia and one was critical cases. Children younger than 2 years were more susceptible to COVID-19. All patients have received interferon-alpha nebulization, and eight cases including the severe and critical cases were co-administrated ribavirin. Five patients with mild pneumonia were given arbidol. Twenty-three patients were given traditional Chinese medicine (TCM). The average length of stay (LOS) and the time of SARS-CoV-2 clearance were 10.57 and 6.39 days, respectively. None of the factors was associated with LOS or time of SARS-CoV-2 clearance. **CONCLUSIONS:** The severity of COVID-19 in pediatric cases were milder than adults. The efficacy of the antiviral therapy in children with COVID-19 remains to be evaluated.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32446167>

DOI: 10.1016/j.jcv.2020.104425

65. Qiu H, Wu J, Hong L, et al. Clinical and epidemiological features of 36 children with coronavirus disease 2019 (COVID-19) in Zhejiang, China: an observational cohort study. Lancet Infect Dis. 2020;20(6):689-96. DOI: 10.1016/S1473-3099(20)30198-5

ABSTRACT: **BACKGROUND:** Since December, 2019, an outbreak of coronavirus disease 2019 (COVID-19) has spread globally. Little is known about the epidemiological and clinical features of paediatric patients with COVID-19. **METHODS:** We retrospectively retrieved data for paediatric patients (aged 0-16 years) with confirmed

COVID-19 from electronic medical records in three hospitals in Zhejiang, China. We recorded patients' epidemiological and clinical features. FINDINGS: From Jan 17 to March 1, 2020, 36 children (mean age 8.3 [SD 3.5] years) were identified to be infected with severe acute respiratory syndrome coronavirus 2. The route of transmission was by close contact with family members (32 [89%]) or a history of exposure to the epidemic area (12 [33%]); eight (22%) patients had both exposures. 19 (53%) patients had moderate clinical type with pneumonia; 17 (47%) had mild clinical type and either were asymptomatic (ten [28%]) or had acute upper respiratory symptoms (seven [19%]). Common symptoms on admission were fever (13 [36%]) and dry cough (seven [19%]). Of those with fever, four (11%) had a body temperature of 38.5 degrees C or higher, and nine (25%) had a body temperature of 37.5-38.5 degrees C. Typical abnormal laboratory findings were elevated creatine kinase MB (11 [31%]), decreased lymphocytes (11 [31%]), leucopenia (seven [19%]), and elevated procalcitonin (six [17%]). Besides radiographic presentations, variables that were associated significantly with severity of COVID-19 were decreased lymphocytes, elevated body temperature, and high levels of procalcitonin, D-dimer, and creatine kinase MB. All children received interferon alfa by aerosolisation twice a day, 14 (39%) received lopinavir-ritonavir syrup twice a day, and six (17%) needed oxygen inhalation. Mean time in hospital was 14 (SD 3) days. By Feb 28, 2020, all patients were cured. INTERPRETATION: Although all paediatric patients in our cohort had mild or moderate type of COVID-19, the large proportion of asymptomatic children indicates the difficulty in identifying paediatric patients who do not have clear epidemiological information, leading to a dangerous situation in community-acquired infections. FUNDING: Ningbo Clinical Research Center for Children's Health and Diseases, Ningbo Reproductive Medicine Centre, and Key Scientific and Technological Innovation Projects of Wenzhou.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32220650>

DOI: 10.1016/S1473-3099(20)30198-5

66. Raba AA, Abobaker A, Elgenaidi IS, et al. Novel coronavirus infection (COVID-19) in children younger than one year: A systematic review of symptoms, management and outcomes. Acta Paediatrica, International Journal of Paediatrics. 2020.

ABSTRACT: Aim: The aim of this systematic review was to evaluate the clinical characteristics of COVID-19 in neonates and children under one year of age. Method(s): A systematic literature review of the MEDLINE, PubMed, CINAHL, Embase and EBSCO databases was carried out for studies from January 1, 2020, to April 7, 2020. We included all papers that addressed clinical manifestations, laboratory results, imaging findings and outcomes in infants and neonates. Result(s): Our search identified 77 peer-reviewed papers, and 18 papers covering 160 infants were reviewed. One paper was from Vietnam, and the other 17 were from China: eight were cross-sectional studies, eight were case reports, one was a case series, and one was a prospective cohort study. The most common clinical symptoms were fever (54%) and cough (33%). Most infants were treated symptomatically, with frequent use of various empirical medications. Infants and neonates tended to have more severe COVID-19 disease than older children: 11 (7%) were admitted to intensive care and one infant died. The mortality rate was 0.006%, with favourable outcomes in most cases. Conclusion(s): Infants and neonates were more vulnerable to more severe COVID-19 disease than older children, but morbidity and mortality were low.

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URL: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexb&AN=2005481897>

67. Rawat M, Chandrasekharan P, Hicar MD, et al. COVID-19 in Newborns and Infants-Low Risk of Severe Disease: Silver Lining or Dark Cloud? Am J Perinatol. 2020;37(8):845-9. DOI: 10.1055/s-0040-1710512

ABSTRACT: One hundred years after the 1918 influenza pandemic, we now face another pandemic with the severe acute respiratory syndrome-novel coronavirus-2 (SARS-CoV-2). There is considerable variability in the incidence of infection and severe disease following exposure to SARS-CoV-2. Data from China and the United States suggest a low prevalence of neonates, infants, and children, with those affected not suffering from severe disease. In this article, we speculate different theories why this novel agent is sparing neonates, infants, and young children. The low severity of SARS-CoV-2 infection in this population is associated with a high incidence of

asymptomatic or mildly symptomatic infection making them efficient carriers. KEY POINTS: . There is a low prevalence of novel coronavirus disease in neonates, infants, and children.. . The fetal hemoglobin may play a protective role against coronavirus in neonates.. . Immature angiotensin converting enzyme (ACE2) interferes with coronavirus entry into the cells..

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32380565>

DOI: 10.1055/s-0040-1710512

68. Romani L, Chiurciu S, Santilli V, et al. COVID-19 in Italian pediatric patients: the experience of a tertiary children's hospital. Acta paediatrica. 2020(pagination).

ABSTRACT: Coronavirus disease (COVID-19) caused by the novel SARS-CoV-2 has spread worldwide since its onset in Wuhan in December 2019. In Italy COVID-19 rapidly increased in February 2020 and by 12 May 2020, 2.0 % of the confirmed cases were under 18 years and 3.7% of those had been hospitalized. This case series report reviews the demographic characteristics, clinical course, laboratory findings, radiologic features and treatment of children admitted with COVID-19 to a tertiary care hospital in Italy. Copyright This article is protected by copyright. All rights reserved.

URL: <http://ovidsp.ovid.com/ovidweb.cgi?T=JS&CSC=Y&NEWS=N&PAGE=fulltext&D=emexb&AN=632309242>

69. Sankar J, Dhochak N, Kabra SK, et al. COVID-19 in Children: Clinical Approach and Management. Indian J Pediatr. 2020;87(6):433-42. DOI: 10.1007/s12098-020-03292-1

ABSTRACT: COVID-19 pandemic caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a major public health crisis threatening humanity at this point in time. Transmission of the infection occurs by inhalation of infected droplets or direct contact with soiled surfaces and fomites. It should be suspected in all symptomatic children who have undertaken international travel in the last 14 d, all hospitalized children with severe acute respiratory illness, and asymptomatic direct and high-risk contacts of a confirmed case. Clinical symptoms are similar to any acute respiratory viral infection with less pronounced nasal symptoms. Disease seems to be milder in children, but situation appears to be changing. Infants and young children had relatively more severe illness than older children. The case fatality rate is low in children. Diagnosis can be confirmed by Reverse transcriptase - Polymerase chain reaction (RT-PCR) on respiratory specimen (commonly nasopharyngeal and oropharyngeal swab). Rapid progress is being made to develop rapid diagnostic tests, which will help ramp up the capacity to test and also reduce the time to getting test results. Management is mainly supportive care. In severe pneumonia and critically ill children, trial of hydroxychloroquine or lopinavir/ritonavir should be considered. As per current policy, children with mild disease also need to be hospitalized; if this is not feasible, these children may be managed on ambulatory basis with strict home isolation. Pneumonia, severe disease and critical illness require admission and aggressive management for acute lung injury and shock and/or multiorgan dysfunction, if present. An early intubation is preferred over non-invasive ventilation or heated, humidified, high flow nasal cannula oxygen, as these may generate aerosols increasing the risk of infection in health care personnel. To prevent post discharge dissemination of infection, home isolation for 1-2 wk may be advised. As of now, no vaccine or specific chemotherapeutic agents are approved for children.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32338347>

DOI: 10.1007/s12098-020-03292-1

70. She J, Liu L, Liu W. COVID-19 epidemic: Disease characteristics in children. J Med Virol. 2020;92(7):747-54. DOI: 10.1002/jmv.25807

ABSTRACT: In mid-December 2019, a disease caused by infection with severe acute respiratory syndrome coronavirus-2, which began in Wuhan, China, has spread throughout the country and many countries around the world. The number of children with coronavirus disease-2019 (COVID-19) has also increased significantly. Although information regarding the epidemiology of COVID-19 in children has accumulated, relevant comprehensive reports are lacking. The present article reviews the epidemiological characteristics of COVID-19 in children.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32232980>

DOI: 10.1002/jmv.25807

71. Shekerdemian LS, Mahmood NR, Wolfe KK, et al. Characteristics and Outcomes of Children With Coronavirus Disease 2019 (COVID-19) Infection Admitted to US and Canadian Pediatric Intensive Care Units. *JAMA pediatrics*. 2020. DOI: 10.1001/jamapediatrics.2020.1948

ABSTRACT: Importance: The recent and ongoing coronavirus disease 2019 (COVID-19) pandemic has taken an unprecedented toll on adults critically ill with COVID-19 infection. While there is evidence that the burden of COVID-19 infection in hospitalized children is lesser than in their adult counterparts, to date, there are only limited reports describing COVID-19 in pediatric intensive care units (PICUs). Objective: To provide an early description and characterization of COVID-19 infection in North American PICUs, focusing on mode of presentation, presence of comorbidities, severity of disease, therapeutic interventions, clinical trajectory, and early outcomes. Design, Setting, and Participants: This cross-sectional study included children positive for COVID-19 admitted to 46 North American PICUs between March 14 and April 3, 2020, with follow-up to April 10, 2020. Main Outcomes and Measures: Prehospital characteristics, clinical trajectory, and hospital outcomes of children admitted to PICUs with confirmed COVID-19 infection. Results: Of the 48 children with COVID-19 admitted to participating PICUs, 25 (52%) were male, and the median (range) age was 13 (4.2-16.6) years. Forty patients (83%) had significant preexisting comorbidities; 35 (73%) presented with respiratory symptoms and 18 (38%) required invasive ventilation. Eleven patients (23%) had failure of 2 or more organ systems. Extracorporeal membrane oxygenation was required for 1 patient (2%). Targeted therapies were used in 28 patients (61%), with hydroxychloroquine being the most commonly used agent either alone (11 patients) or in combination (10 patients). At the completion of the follow-up period, 2 patients (4%) had died and 15 (31%) were still hospitalized, with 3 still requiring ventilatory support and 1 receiving extracorporeal membrane oxygenation. The median (range) PICU and hospital lengths of stay for those who had been discharged were 5 (3-9) days and 7 (4-13) days, respectively. Conclusions and Relevance: This early report describes the burden of COVID-19 infection in North American PICUs and confirms that severe illness in children is significant but far less frequent than in adults. Prehospital comorbidities appear to be an important factor in children. These preliminary observations provide an important platform for larger and more extensive studies of children with COVID-19 infection.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32392288>

DOI: 10.1001/jamapediatrics.2020.1948

72. Song W, Li J, Zou N, et al. Clinical features of pediatric patients with coronavirus disease (COVID-19). *J Clin Virol*. 2020;127:104377. DOI: 10.1016/j.jcv.2020.104377

ABSTRACT: BACKGROUND: Coronavirus disease 2019 (COVID-19) caused by SARS-CoV-2 has spread around the world, and reports of children with COVID-19 are increasing. OBJECTIVES: To assess clinical profiles of pediatric COVID-19. STUDY DESIGN: A retrospective analysis was undertaken using clinical data of sixteen children (11 months-14 years) diagnosed with COVID-19 between January 1, 2020 and March 17, 2020 at Xiangyang Central Hospital, Hubei province, China. RESULTS: All children had positive epidemiologic histories, 12 (12/16, 75 %) involving family units. The illnesses were either mild (5/16, 31.3 %) or ordinary (11/16, 68.8 %), presenting as follows: asymptomatic (8/16, 50 %), fever and/or cough (8/16, 50 %). Four asymptomatic patients (4/16, 25 %) in ordinary cases had chest computed tomography (CT) abnormalities. Leukocyte counts were normal in 14 cases (88 %), but 2 patients (12.5 %) had leukopenia, and 1 (6.3 %) was lymphopenic. There were 11 patients with chest CT abnormalities, some nodular, others small patchy and others ground-glass opacities. In asymptomatic children, the median time to SARS-CoV-2 nucleic acid test (NAT) positivity once exposed to a family member with confirmed infection was 15.5 days (range, 10-26 days). The median time to first NAT-negative conversion was 5.5 days (range, 1-23 days). CONCLUSIONS: COVID-19 in children of Xiangyang city is often family acquired and not serious, with favorable outcomes. Asymptomatic children can be diagnosed as pneumonia because of chest CT abnormalities. It is essential to actively screen this segment of the population.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32361323>

DOI: 10.1016/j.jcv.2020.104377

73. Su L, Ma X, Yu H, et al. The different clinical characteristics of corona virus disease cases between children and their families in China - the character of children with COVID-19. Emerg Microbes Infect. 2020;9(1):707-13.

DOI: 10.1080/22221751.2020.1744483

ABSTRACT: This study aims to analyze the different clinical characteristics between children and their families infected with severe acute respiratory syndrome coronavirus 2. Clinical data from nine children and their 14 families were collected, including general status, clinical, laboratory test, and imaging characteristics. All the children were detected positive result after their families onset. Three children had fever (22.2%) or cough (11.2%) symptoms and six (66.7%) children had no symptom. Among the 14 adult patients, the major symptoms included fever (57.1%), cough (35.7%), chest tightness/pain (21.4%), fatigue (21.4%) and sore throat (7.1%). Nearly 70% of the patients had normal (71.4%) or decreased (28.6%) white blood cell counts, and 50% (7/14) had lymphocytopenia. There were 10 adults (71.4%) showed abnormal imaging. The main manifestations were pulmonary consolidation (70%), nodular shadow (50%), and ground glass opacity (50%). Five discharged children were admitted again because their stool showed positive result in SARS-CoV-2 PCR. COVID-19 in children is mainly caused by family transmission, and their symptoms are mild and prognosis is better than adult. However, their PCR result in stool showed longer time than their families. Because of the mild or asymptomatic clinical process, it is difficult to recognize early for pediatrician and public health staff.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32208917>

DOI: 10.1080/22221751.2020.1744483

74. Sun D, Chen X, Li H, et al. SARS-CoV-2 infection in infants under 1 year of age in Wuhan City, China. World J Pediatr. 2020;16(3):260-6. DOI: 10.1007/s12519-020-00368-y

ABSTRACT: BACKGROUND: The clinical characteristics and outcome of COVID-19 in children are different from those in adults. We aimed to describe the characteristics of infants under 1 year of age (excluding newborns) with COVID-19. METHODS: We retrospectively retrieved data of 36 infants with SARS-CoV-2 infection in Wuhan Children's Hospital from January 26 to March 22, 2020. Clinical features, chest imaging findings, laboratory tests results, treatments and clinical outcomes were analyzed. RESULTS: The mean age of the infected infants was 6.43 months, with a range of 2-12 months. 61.11% of the patients were males and 38.89% females. 86.11% of the infants were infected due to family clustering. Cough (77.78%) and fever (47.22%) were the most common clinical manifestations. Chest CT scan revealed 61.11% bilateral pneumonia and 36.11% unilateral pneumonia. 47.22% of the infants developed complications. Increased leucocytes, neutrophils, lymphocytes, and thrombocytes were observed in 11.11, 8.33, 36.11 and 44.44% of infants, respectively. Decreased leucocytes, neutrophils, thrombocyte and hemoglobin were observed in 8.33, 19.44, 2.78 and 36.11% of infants, respectively. Increased C-reactive protein, procalcitonin, lactate dehydrogenase, alanine aminotransferase, creatine kinase and D-dimer were observed in 19.44, 67.74, 47.22, 19.44, 22.22 and 20.69% of infants, respectively. Only one infant had a high level of creatinine. Co-infections with other respiratory pathogens were observed in 62.86% of infants. CD3 (20.69%), CD4 (68.97%), CD19 (31.03%) and Th/Ts (44.83%) were elevated; CD8 (6.9%) and CD16+CD56 (48.28%) was reduced. IL-4 (7.69%), IL-6 (19.23%), IL-10 (50%), TNF-alpha (11.54%) and IFN-gamma (19.23%) were elevated. Up to March 22, 97.22% of infants recovered, while a critical ill infant died. When the infant's condition deteriorates rapidly, lymphocytopenia was discovered. Meanwhile, C-reactive protein, D-dimer, alanine aminotransferase, creatine kinase, creatinine, IL-6 and IL-10 increased significantly. CONCLUSIONS: In the cohort, we discovered that lymphocytosis, elevated CD4 and IL-10, and co-infections were common in infants with COVID-19, which were different from adults with COVID-19. Most infants with COVID-19 have mild clinical symptoms and good prognosis.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32504360>

DOI: 10.1007/s12519-020-00368-y

75. Tan YP, Tan BY, Pan J, et al. Epidemiologic and clinical characteristics of 10 children with coronavirus disease 2019 in Changsha, China. J Clin Virol. 2020;127:104353. DOI: 10.1016/j.jcv.2020.104353

ABSTRACT: BACKGROUND: The outbreak of a new coronavirus, first reported in Wuhan, China, is spreading around the world. Information on the characteristics of children with Coronavirus Disease 2019 (COVID-19) is limited. METHODS: In this retrospective study, we recruited 10 children infected with SARS-COV-2 from January 27 to March 10, 2020, in Changsha, China. We report the epidemiological, clinical, laboratory, and high-resolution CT findings for these children. Qualitative descriptive analysis was used to describe the key results. RESULTS: Ten children were included. Three were male and seven were female. Three were from Wuhan, Hubei Province, and seven were from Changsha. All had a history of close contact with adults with COVID-19 before the onset of disease. Clinical manifestations included fever in four cases, respiratory symptoms in three cases, febrile convulsions in one case, vomiting in one case, abdominal pain in one case, and asymptomatic infection in two cases. All the children tested positive for nucleic acid in throat swabs at admission. Stool swabs of three cases were positive for nucleic acid after several days of fever. In nine children, blood routine results were normal, whereas in one case the white blood cell count was elevated. In four cases, CT findings of the lungs showed light ground-glass opacities, one case showed changes similar to bronchopneumonia, and the remaining cases were normal. All were treated with symptomatic support without complications. CONCLUSION: Our findings indicate that 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. The results of stool swab tests should be considered for discharge and release from isolation.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32302953>

DOI: 10.1016/j.jcv.2020.104353

76. Team CC-R. Coronavirus Disease 2019 in Children - United States, February 12-April 2, 2020. MMWR Morbidity and mortality weekly report. 2020;69(14):422-6. DOI: 10.15585/mmwr.mm6914e4

ABSTRACT: As of April 2, 2020, the coronavirus disease 2019 (COVID-19) pandemic has resulted in >890,000 cases and >45,000 deaths worldwide, including 239,279 cases and 5,443 deaths in the United States (1,2). In the United States, 22% of the population is made up of infants, children, and adolescents aged <18 years (children) (3). Data from China suggest that pediatric COVID-19 cases might be less severe than cases in adults and that children might experience different symptoms than do adults (4,5); however, disease characteristics among pediatric patients in the United States have not been described. Data from 149,760 laboratory-confirmed COVID-19 cases in the United States occurring during February 12-April 2, 2020 were analyzed. Among 149,082 (99.6%) reported cases for which age was known, 2,572 (1.7%) were among children aged <18 years. Data were available for a small proportion of patients on many important variables, including symptoms (9.4%), underlying conditions (13%), and hospitalization status (33%). Among those with available information, 73% of pediatric patients had symptoms of fever, cough, or shortness of breath compared with 93% of adults aged 18-64 years during the same period; 5.7% of all pediatric patients, or 20% of those for whom hospitalization status was known, were hospitalized, lower than the percentages hospitalized among all adults aged 18-64 years (10%) or those with known hospitalization status (33%). Three deaths were reported among the pediatric cases included in this analysis. These data support previous findings that children with COVID-19 might not have reported fever or cough as often as do adults (4). Whereas most COVID-19 cases in children are not severe, serious COVID-19 illness resulting in hospitalization still occurs in this age group. Social distancing and everyday preventive behaviors remain important for all age groups as patients with less serious illness and those without symptoms likely play an important role in disease transmission (6,7).

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32271728>

DOI: 10.15585/mmwr.mm6914e4

77. Tezer H, Bedir Demirdag T. Novel coronavirus disease (COVID-19) in children. Turk J Med Sci. 2020;50(SI-1):592-603. DOI: 10.3906/sag-2004-174

ABSTRACT: Coronavirus disease (COVID-19) was firstly reported at the end of 2019. The disease rapidly spread all around the world in a few months and was declared a worldwide pandemic by WHO in March 2020. By April 9, there were 1,436,198 confirmed COVID-19 cases in the world, nearly with 6% mortality rate. This novel infectious disease causes respiratory tract illness that may generally occur as mild upper respiratory tract disease or pneumonia. In older patients and/or patients with underlying conditions, it may result in acute respiratory distress syndrome, multi organ failure and even death. According to the current literature, children account approximately for 1%-5% of diagnosed COVID-19 cases. Generally, COVID-19 seems to be a less severe disease for children than adults. Approximately 90% of pediatric patients are diagnosed as asymptomatic, mild, or moderate disease. However, up to 6.7% of cases may be severe. Severe illness is generally seen in patients smaller than 1 year of age and patients who have underlying diseases. The epidemiological and clinical patterns of COVID-19 and treatment approaches in pediatric patients still remain unclear although many pediatric reports are published. This review aims to summarize the current epidemics, clinical presentations, diagnosis, and treatment of COVID-19 in pediatric patients.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32304191>

DOI: 10.3906/sag-2004-174

78. Tung Ho CL, Oligbu P, Ojubolamo O, et al. Clinical Characteristics of Children with COVID-19. AIMS Public Health. 2020;7(2):258-73. DOI: 10.3934/publichealth.2020022

ABSTRACT: Background: In December 2019, the infection caused by 2019 novel coronavirus (COVID-19) led to an outbreak in Wuhan, situated in the Hubei Province of China. Following this, there has been a rapid increase in the number of cases. On 12th March 2020, there were over 100,000 confirmed cases and almost 4,300 deaths worldwide. The clinical profile of children with COVID-19 is unknown due to the few number of cases reported. Currently, available data suggest they may have a milder form of illness. Methods: A review of the literature published from June 2019 to March 2020 was undertaken to evaluate the clinical presentation, management and outcomes of COVID-19 in children. Data sources included EMBASE, MEDLINE, Cochrane library, ISI Web of Knowledge and references within identified articles. Results: We identified 303 potential studies, and 295 were excluded for reasons including duplicates, experimental studies and case reports. Eight studies were eligible for inclusion, including a total of 820 paediatric cases of COVID-19. Asymptomatic cases represented 14.3% (n = 117) of the total number of cases identified, and thus the remaining 85.7% (n = 703) experienced symptoms. Fever was the commonest symptom in 53.9% (n = 48) of cases, followed by cough in 39.3% (n = 35) of cases, and rhinorrhoea or pharyngeal congestion in 13.5% (n = 12) of cases. Diarrhoea and sore throats were less common symptoms, 7.9% (n = 7) and 9.0% (n = 8) respectively. Other symptoms, including fatigue, headache and dizziness were rare. Conclusion: Children are disproportionately affected by COVID-19 and are more likely to run a milder cause of illness following this infection compared to adults. This outbreak only started 3 months ago, therefore, further population wide studies are needed to validate these findings.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32617354>

DOI: 10.3934/publichealth.2020022

79. Walker DM, Tolentino VR. COVID-19: The impact on pediatric emergency care. Pediatr Emerg Med Pract. 2020;17(Suppl 6-1):1-27.

ABSTRACT: Although there is still much that is not understood, experience with previous coronavirus outbreaks and available data on COVID-19 indicate a reduced propensity to affect children. Nonetheless, serious complications-although rare-are being seen in pediatric patients. This review, written with the emergency medicine clinician in mind, describes the epidemiology, clinical features, and management implications for COVID-19 in pediatric patients. It includes a discussion of multisystem inflammatory syndrome in children (MIS-C) associated with COVID-19, as well as other aspects of the COVID-19 pandemic that are affecting children and families, such as poisonings, childhood immunizations, mental health, nonaccidental trauma, and neglect.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32496723>

80. Waltuch T, Gill P, Zinns LE, et al. Features of COVID-19 post-infectious cytokine release syndrome in children presenting to the emergency department. Am J Emerg Med. 2020;S0735-6757(20)30403-4. DOI: 10.1016/j.ajem.2020.05.058

ABSTRACT: The 2019 coronavirus disease (COVID-19) has not appeared to affect children as severely as adults. However, approximately 1 month after the COVID-19 peak in New York City in April 2020, cases of children with prolonged fevers abruptly developing inflammatory shock-like states have been reported in Western Europe and the United States. This case series describes four previously healthy children with COVID-19 infection confirmed by serologic antibody testing, but negative by nasopharyngeal RT-PCR swab, presenting to the Pediatric Emergency Department (PED) with prolonged fever (5 or more days) and abrupt onset of hemodynamic instability with elevated serologic inflammatory markers and cytokine levels (IL-6, IL-8 and TNF-alpha). Emergency physicians must maintain a high clinical suspicion for this COVID-19 associated post-infectious cytokine release syndrome, with features that overlap with Kawasaki Disease (KD) and Toxic Shock Syndrome (TSS) in children with recent or current COVID-19 infection, as patients can decompensate quickly.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32471782>

DOI: 10.1016/j.ajem.2020.05.058

81. Wang Y, Zhu F, Wang C, et al. Children Hospitalized With Severe COVID-19 in Wuhan. The Pediatric infectious disease journal. 2020;39(7):e91-e4. DOI: 10.1097/INF.0000000000002739

ABSTRACT: BACKGROUND: Novel coronavirus disease (COVID-19) is spreading globally. Little is known about the risk factors for the clinical outcomes of COVID-19 in children. METHODS: A retrospective case-control study was taken in children with severe acute respiratory syndrome coronavirus-2 infection in Wuhan Children's Hospital. Risk factors associated with the development of COVID-19 and progression were collected and analyzed. RESULTS: Eight of 260 children diagnosed with severe COVID-19 pneumonia were included in the study. Thirty-five children with COVID-19 infection matched for age, sex and date of admission, and who classified as non-severe type, were randomly selected from the hospital admissions. For cases with severe pneumonia caused by COVID-19, the most common symptoms were dyspnea (87.5%), fever (62.5%) and cough (62.5%). In laboratory, white blood cells count was significantly higher in severe children than non-severe children. Levels of inflammation bio-makers such as hsCRP, IL-6, IL-10 and D-dimer elevated in severe children compared with non-severe children on admission. The level of total bilirubin and uric acid clearly elevated in severe children compared with non-severe children on admission. All of severe children displayed the lesions on chest CT, more lung segments were involved in severe children than in non-severe children, which was only risk factor associated with severe COVID-19 pneumonia in multivariable analysis. CONCLUSIONS: More than 3 lung segments involved were associated with greater risk of development of severe COVID-19 in children. Moreover, the possible risk of the elevation of IL-6, high total bilirubin and D-dimer with univariable analysis could identify patients to be severe earlier.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32384397>

DOI: 10.1097/INF.0000000000002739

82. Wang Z, Zhou Q, Wang C, et al. Clinical characteristics of children with COVID-19: a rapid review and meta-analysis. Ann Transl Med. 2020;8(10):620. DOI: 10.21037/atm-20-3302

ABSTRACT: Background: Most guidelines on COVID-19 published so far include recommendations for patients regardless of age. Clinicians need a more accurate understanding of the clinical characteristics of children with COVID-19. Methods: We searched studies reporting clinical characteristics in children with COVID-19 published until March 31, 2020. We screened the literature, extracted the data and evaluated the risk of bias and quality of evidence of the included studies. We combined some of the outcomes (symptoms) in a single-arm meta-analysis using a random-effects model. Results: Our search retrieved 49 studies, including 25 case reports, 23 case series and one cohort study, with a total of 1,667 patients. Our meta-analysis showed that most children with COVID-19 have mild symptoms. Eighty-three percent of the children were within family clusters of cases, and 19% had no symptoms. At least 7% with digestive symptoms. The main symptoms of children were fever

[48%, 95% confidence interval (CI): 39%, 56%] and cough (39%, 95% CI: 30%, 48%). The lymphocyte count was below normal level in only 15% (95% CI: 8%, 22%) of children which is different from adult patients. 66% (95% CI: 55%, 77%) of children had abnormal findings in CT imaging. Conclusions: Most children with COVID-19 have only mild symptoms, and many children are asymptomatic. Fever and cough are the most common symptoms in children. Vomiting and diarrhea were not common in children. The lymphocyte count is usually within the normal range in children.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32566557>

DOI: 10.21037/atm-20-3302

83. Wu H, Zhu H, Yuan C, et al. Clinical and Immune Features of Hospitalized Pediatric Patients With Coronavirus Disease 2019 (COVID-19) in Wuhan, China. JAMA Netw Open. 2020;3(6):e2010895. DOI: 10.1001/jamanetworkopen.2020.10895

ABSTRACT: Importance: The epidemiologic and clinical characteristics of pediatric patients with coronavirus disease 2019 (COVID-19) have been reported, but information on immune features associated with disease severity is scarce. Objective: To delineate and compare the immunologic features of mild and moderate COVID-19 in pediatric patients. Design, Setting, and Participants: This single-center case series included 157 pediatric patients admitted to Wuhan Children's Hospital with laboratory-confirmed severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Data were collected from January 25 to April 18, 2020. Exposures: Documented SARS-CoV-2 infection. Main Outcomes and Measures: Clinical and immunologic characteristics were collected and analyzed. Outcomes were observed until April 18, 2020. Results: Of the 157 pediatric patients with COVID-19, 60 (38.2%) had mild clinical type with pneumonia, 88 (56.1%) had moderate cases, 6 (3.8%) had severe cases, and 3 (1.9%) were critically ill. The 148 children with mild or moderate disease had a median (interquartile range [IQR]) age of 84 (18-123) months, and 88 (59.5%) were girls. The most common laboratory abnormalities were increased levels of alanine aminotransferase (ALT) (median [IQR], 16.0 [12.0-26.0] U/L), aspartate aminotransferase (AST) (median [IQR], 30.0 [23.0-41.8] U/L), creatine kinase MB (CK-MB) activity (median [IQR], 24.0 [18.0-34.0] U/L), and lactate dehydrogenase (LDH) (median [IQR], 243.0 [203.0-297.0] U/L), which are associated with liver and myocardial injury. Compared with mild cases, levels of inflammatory cytokines including interleukin 6, tumor necrosis factor alpha, and interferon gamma were unchanged, whereas the level of immune suppressive interleukin 10 was markedly increased in moderate cases compared with mild cases (median [IQR], 3.96 [3.34-5.29] pg/mL vs 3.58 [3.10-4.36] pg/mL; $P = .048$). There was no statistically significant difference in absolute number of lymphocytes (including T cells and B cells) between mild and moderate cases, but moderate cases were associated with a decrease in neutrophil levels compared with mild cases (median [IQR], 2310/muL [1680/muL-3510/muL] vs 3120/muL [2040/muL-4170/muL]; $P = .01$). Immunoglobulin G and the neutrophil to lymphocyte ratio were negatively associated with biochemical indices related to liver and myocardial injury (immunoglobulin G, ALT: $r, -0.3579$; AST: $r, -0.5280$; CK-MB activity: $r, -0.4786$; LDH: $r, -0.4984$; and neutrophil to lymphocyte ratio, ALT: $r, -0.1893$; AST: $r, -0.3912$; CK-MB activity: $r, -0.3428$; LDH: $r, -0.3234$), while counts of lymphocytes, CD4+ T cells, and interleukin 10 showed positive associations (lymphocytes, ALT: $r, 0.2055$; AST: $r, 0.3615$; CK-MB activity: $r, 0.338$; LDH: $r, 0.3309$; CD4+ T cells, AST: $r, 0.4701$; CK-MB activity: $r, 0.4151$; LDH: $r, 0.4418$; interleukin 10, ALT: $r, 0.2595$; AST: $r, 0.3386$; CK-MB activity: $r, 0.3948$; LDH: $r, 0.3794$). Conclusions and Relevance: In this case series, systemic inflammation rarely occurred in pediatric patients with COVID-19, in contrast with the lymphopenia and aggravated inflammatory responses frequently observed in adults with COVID-19. Gaining a deeper understanding of the role of neutrophils, CD4+ T cells, and B cells in the pathogenesis of SARS-CoV-2 infection could be important for the clinical management of COVID-19.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32492165>

DOI: 10.1001/jamanetworkopen.2020.10895

84. Wu Q, Xing Y, Shi L, et al. Coinfection and Other Clinical Characteristics of COVID-19 in Children. Pediatrics. 2020;146(1):07. DOI: 10.1542/peds.2020-0961

ABSTRACT: BACKGROUND AND OBJECTIVES: Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is a newly identified pathogen that mainly spreads by droplets. Most published studies have been focused on adult patients with coronavirus disease 2019 (COVID-19), but data concerning pediatric patients are limited. In this study, we aimed to determine epidemiological characteristics and clinical features of pediatric patients with COVID-19. METHODS: We reviewed and analyzed data on pediatric patients with laboratory-confirmed COVID-19, including basic information, epidemiological history, clinical manifestations, laboratory and radiologic findings, treatment, outcome, and follow-up results. RESULTS: A total of 74 pediatric patients with COVID-19 were included in this study. Of the 68 case patients whose epidemiological data were complete, 65 (65 of 68; 95.59%) were household contacts of adults. Cough (32.43%) and fever (27.03%) were the predominant symptoms of 44 (59.46%) symptomatic patients at onset of the illness. Abnormalities in leukocyte count were found in 23 (31.08%) children, and 10 (13.51%) children presented with abnormal lymphocyte count. Of the 34 (45.95%) patients who had nucleic acid testing results for common respiratory pathogens, 19 (51.35%) showed coinfection with other pathogens other than SARS-CoV-2. Ten (13.51%) children had real-time reverse transcription polymerase chain reaction analysis for fecal specimens, and 8 of them showed prolonged existence of SARS-CoV-2 RNA. CONCLUSIONS: Pediatric patients with COVID-19 presented with distinct epidemiological, clinical, and radiologic characteristics from adult patients. Nearly one-half of the infected children had coinfection with other common respiratory pathogens. It is not uncommon for pediatric patients to have prolonged fecal shedding of SARS-CoV-2 RNA during the convalescent phase.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32376725>

DOI: 10.1542/peds.2020-0961

85. Xia W, Shao J, Guo Y, et al. Clinical and CT features in pediatric patients with COVID-19 infection: Different points from adults. *Pediatr Pulmonol.* 2020;55(5):1169-74. DOI: 10.1002/ppul.24718

ABSTRACT: PURPOSE: To discuss the different characteristics of clinical, laboratory, and chest computed tomography (CT) in pediatric patients from adults with 2019 novel coronavirus (COVID-19) infection. METHODS: The clinical, laboratory, and chest CT features of 20 pediatric inpatients with COVID-19 infection confirmed by pharyngeal swab COVID-19 nucleic acid test were retrospectively analyzed during 23 January and 8 February 2020. The clinical and laboratory information was obtained from inpatient records. All the patients were undergone chest CT in our hospital. RESULTS: Thirteen pediatric patients (13/20, 65%) had an identified history of close contact with COVID-19 diagnosed family members. Fever (12/20, 60%) and cough (13/20, 65%) were the most common symptoms. For laboratory findings, procalcitonin elevation (16/20, 80%) should be pay attention to, which is not common in adults. Coinfection (8/20, 40%) is common in pediatric patients. A total of 6 patients presented with unilateral pulmonary lesions (6/20, 30%), 10 with bilateral pulmonary lesions (10/20, 50%), and 4 cases showed no abnormality on chest CT (4/20, 20%). Consolidation with surrounding halo sign was observed in 10 patients (10/20, 50%), ground-glass opacities were observed in 12 patients (12/20, 60%), fine mesh shadow was observed in 4 patients (4/20, 20%), and tiny nodules were observed in 3 patients (3/20, 15%). CONCLUSION: Procalcitonin elevation and consolidation with surrounding halo signs were common in pediatric patients which were different from adults. It is suggested that underlying coinfection may be more common in pediatrics, and the consolidation with surrounding halo sign which is considered as a typical sign in pediatric patients.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32134205>

DOI: 10.1002/ppul.24718

86. Yoldas MA, Yoldas H. Pediatric COVID-19 Disease: A Review of the Recent Literature. *Pediatr Ann.* 2020;49(7):e319-e25. DOI: 10.3928/19382359-20200615-01

ABSTRACT: The first pediatric coronavirus disease 2019 (COVID-19) case was confirmed in Shenzhen, China on January 20, 2020. At the beginning of the outbreak, COVID-19 pneumonia was more common in adults than in children and adolescents, and the rate of confirmed pediatric cases was relatively lower. However, as screening tests and pathogen detection campaigns were initiated in more regions as the outbreak spread, the number of

pediatric infection cases increased significantly. Currently, studies on pediatric COVID-19 are limited in the literature to case reports and case series, and a few epidemiological studies. COVID-19 has distinct characteristics in the pediatric population compared to adults; therefore, we need to better understand the characteristics of this disease in children. Discovering the characteristics of the pediatric COVID-19 disease is important for contributing to the diagnosis and treatment of the disease in this population. In this review, clinical characteristics, epidemiology, diagnosis, and management of pediatric COVID-19 pneumonia based on the recent literature are discussed. [Pediatr Ann. 2020;49(7):e319-e325.].

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32674170>

DOI: 10.3928/19382359-20200615-01

87. Zhang C, Gu J, Chen Q, et al. Clinical and epidemiological characteristics of pediatric SARS-CoV-2 infections in China: A multicenter case series. PLoS Med. 2020;17(6):e1003130. DOI: 10.1371/journal.pmed.1003130

ABSTRACT: BACKGROUND: As of April 18, 2020, over 2,000,000 patients had been diagnosed with coronavirus disease-2019 (COVID-19) globally, and more than 140,000 deaths had been reported. The clinical and epidemiological characteristics of adult patients have been documented recently. However, information on pediatric patients is limited. We describe the clinical and epidemiological characteristics of pediatric patients to provide valuable insight into the early diagnosis and assessment of COVID-19 in children. METHODS AND FINDINGS: This retrospective, observational study involves a case series performed at 4 hospitals in West China. Thirty-four pediatric patients with COVID-19 were included from January 27 to February 23, 2020. The final follow-up visit was completed by March 16, 2020. Clinical and epidemiological characteristics were analyzed on the basis of demographic data, medical history, laboratory tests, radiological findings, and treatment information. Data analysis was performed for 34 pediatric patients with COVID-19 aged from 1 to 144 months (median 33.00, interquartile range 10.00-94.25), among whom 14 males (41%) were included. All the patients in the current study presented mild (18%) or moderate (82%) forms of COVID-19. A total of 48% of patients were noted to be without a history of exposure to an identified source. Mixed infections of other respiratory pathogens were reported in 16 patients (47%). Comorbidities were reported in 6 patients (18%). The most common initial symptoms were fever (76%) and cough (62%). Expectoration (21%), vomiting (12%), and diarrhea (12%) were also reported in a considerable portion of cases. A substantial increase was detected in serum amyloid A for 17 patients (among 20 patients with available data; 85%) and in high-sensitivity C-reactive protein for 17 patients (among 29 patients with available data; 59%), whereas a decrease in prealbumin was noticed in 25 patients (among 32 patients with available data; 78%). In addition, significant increases in the levels of lactate dehydrogenase and alpha-hydroxybutyrate dehydrogenase were detected in 28 patients (among 34 patients with available data; 82%) and 25 patients (among 34 patients with available data; 74%), respectively. Patchy lesions in lobules were detected by chest computed tomographic scans in 28 patients (82%). Ground-glass opacities, which were a typical feature in adults, were rare in pediatric patients (3%). Rapid radiologic progression and a late-onset pattern of lesions in the lobules were also noticed. Lesions in lobules still existed in 24 (among 32 patients with lesions; 75%) patients that were discharged, although the main symptoms disappeared a few days after treatment. All patients were discharged, and the median duration of hospitalization was 10.00 (8.00-14.25) days. The current study was limited by the small sample size and a lack of dynamic detection of inflammatory markers. CONCLUSIONS: Our data systemically presented the clinical and epidemiological features, as well as the outcomes, of pediatric patients with COVID-19. Stratified analysis was performed between mild and moderate cases. The findings offer new insight into early identification and intervention in pediatric patients with COVID-19.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32544155>

DOI: 10.1371/journal.pmed.1003130

88. Zhen-Dong Y, Gao-Jun Z, Run-Ming J, et al. Clinical and transmission dynamics characteristics of 406 children with coronavirus disease 2019 in China: A review. J Infect. 2020;81(2):e11-e5. DOI: 10.1016/j.jinf.2020.04.030

ABSTRACT: OBJECTIVE: Chinese pediatricians are working on the front line to fight COVID-19. They have published a great amount of first-hand clinical data. Collecting their data and forming a large sample for analysis is more conducive to the recognition, prevention and treatment of coronavirus disease 2019 in children. The epidemic prevention and control experience of Chinese pediatricians should be shared with the world. METHODS: By searching Chinese and English literature, the data of 406 children with COVID-19 in China were analyzed. RESULTS: It was found that the clustered incidence of children's families is a dynamic transmission feature; the incidence is low; asymptomatic infections and mild cases account for 44.8%, with only 7 cases of critical illness; laboratory examination of lymphocyte counts is not reduced, as it is for adults; chest CT findings are less severe than those for adults. These presentations are the clinical features of COVID-19 in children. Only 55 of the 406 cases were tested by anal swab for virus nucleic acid, 45 of which were positive, accounting for 81.8% of stool samples. CONCLUSION: There are more children than adults with asymptomatic infections, milder conditions, faster recovery, and a better prognosis. Some concealed morbidity characteristics also bring difficulties to the early identification, prevention and control of COVID-19. COVID-19 screening is needed in the pediatric fever clinic, and respiratory and digestive tract nucleic acid tests should be performed. Efforts should be made to prevent children from becoming a hidden source of transmission in kindergartens, schools or families. Furthermore, China's experience in treating COVID-19 in children has led to faster recovery of sick children.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32360500>

DOI: 10.1016/j.jinf.2020.04.030

89. Zheng F, Liao C, Fan QH, et al. Clinical Characteristics of Children with Coronavirus Disease 2019 in Hubei, China. Curr Med Sci. 2020;40(2):275-80. DOI: 10.1007/s11596-020-2172-6

ABSTRACT: Since December 2019, COVID-19 has occurred unexpectedly and emerged as a health problem worldwide. Despite the rapidly increasing number of cases in subsequent weeks, the clinical characteristics of pediatric cases are rarely described. A cross-sectional multicenter study was carried out in 10 hospitals across Hubei province. A total of 25 confirmed pediatric cases of COVID-19 were collected. The demographic data, epidemiological history, underlying diseases, clinical manifestations, laboratory and radiological data, treatments, and outcomes were analyzed. Of 25 hospitalized patients with COVID-19, the boy to girl ratio was 1.27:1. The median age was 3 years. COVID-19 cases in children aged <3 years, 3-6 years, and ≥6-years patients were 10 (40%), 6 (24%), and 9 (36%), respectively. The most common symptoms at onset of illness were fever (13 [52%]), and dry cough (11 [44%]). Chest CT images showed essential normal in 8 cases (33.3%), unilateral involvement of lungs in 5 cases (20.8%), and bilateral involvement in 11 cases (45.8%). Clinical diagnoses included upper respiratory tract infection (n=8), mild pneumonia (n=15), and critical cases (n=2). Two critical cases (8%) were given invasive mechanical ventilation, corticosteroids, and immunoglobulin. The symptoms in 24 (96%) of 25 patients were alleviated and one patient had been discharged. It was concluded that children were susceptible to COVID-19 like adults, while the clinical presentations and outcomes were more favorable in children. However, children less than 3 years old accounted for majority cases and critical cases lied in this age group, which demanded extra attentions during home caring and hospitalization treatment.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32207032>

DOI: 10.1007/s11596-020-2172-6

90. Zheng G, Wang B, Zhang H, et al. Clinical characteristics of acute respiratory syndrome with SARS-CoV-2 infection in children in South China. Pediatr Pulmonol. 2020. DOI: 10.1002/ppul.24921

ABSTRACT: BACKGROUND: A retrospective study was conducted to summarize the clinical information of childhood infections during the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) epidemic. METHODS: Children with SARS-CoV-2 infection in 11 hospitals from three provinces of South China were included in the study. Clinical information was collected and compared with children and adults infected by SARS-CoV-2 in Wuhan. RESULTS: In total, 52 children were enrolled, including 28 boys. The median age was 9 years (interquartile range [IQR], 4-12); 44.2% cases were of clustered occurrences, 40.4% patients had fever,

48.1% had cough, and 46.2% had a high lymphocyte count. No abnormalities were found in the liver and kidney function. Also, 82.7% of patients received antiviral therapy, but such therapy did not shorten the time to virus negativity or hospital stay ($P = .082$). The time to virus negativity was 12.0 days (IQR, 8.0-16.8) and hospital stay was 14.5 days (IQR, 10.3-17.9). Compared with reports in Wuhan, there were more acute upper respiratory tract infection (AURTI) and fewer pneumonia cases ($P = .000$). Compared with the non-ICU adult COVID-19 in Wuhan, these children's diseases were relatively mild, with fewer complications. CONCLUSIONS: Children with SARS-CoV-2 infection had a mild fever, lymphocyte elevation was more common than reduction, and antiviral treatment had no obvious effect. The overall clinical manifestations were mild, and the prognosis was good.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32579293>

DOI: 10.1002/ppul.24921

91. Zhong Z, Xie X, Huang W, et al. Chest CT findings and clinical features of coronavirus disease 2019 in children. Zhong Nan Da Xue Xue Bao Yi Xue Ban. 2020;45(3):236-42. DOI: 10.11817/j.issn.1672-7347.2020.200206

ABSTRACT: OBJECTIVES: To describe the CT features and clinical characteristics of pediatric patients with coronavirus disease 2019 (COVID-19). METHODS: A total of 9 COVID-19 infected pediatric patients were included in this study. Clinical history, laboratory examination, and detailed CT imaging features were analyzed. All patients underwent the first CT scanning on the same day of being diagnosed by real-time reverse-transcription polymerase chain reaction (rRT-PCR). A low-dose CT scan was performed during follow-up. RESULTS: All the child patients had positive results. Four patients had cough and one patient had fever. One patient presented both cough and fever. Two children presented other symptoms like sore throat and stuffy nose. One child showed no clinical symptom. Five patients had positive initial CT findings with subtle lesions like ground-glass opacity (GGO) or spot-like mixed consolidation. Three patients were reported with negative results in the initial and follow-up CT examination. One patient was reported with initial negative CT findings but turning positive during the first follow-up. All patients had absorbed lesions on follow-up CT images after treatment. CONCLUSIONS: Pediatric COVID-19 patients have certain imaging and clinical features as well as disease prognosis. Children with COVID-19 tend to have normal or subtle CT findings and relatively better outcome.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32386013>

DOI: 10.11817/j.issn.1672-7347.2020.200206

92. Zhu J, Wu Y. COVID-19 Epidemic: Clinical Characteristics of Patients in Pediatric Isolation Ward. Clin Pediatr (Phila). 2020;9922820941228. DOI: 10.1177/0009922820941228

ABSTRACT: In order to accurately admit children with COVID-19 to an isolation ward, our study retrospectively analyzed the clinical characteristics of children in isolation wards during the COVID-19 epidemic. It was found that 55 cases (83.3%) had fever and 48 cases (72.7%) coughed in the isolated area, 31 cases (47%) had a history of exposure, 26 cases (39.4%) had a decrease in lymphocytes (LYM), more than half had an increase in lactate dehydrogenase and creatine kinase isoenzyme, 14 cases (21.2%) had positive SARS-CoV-2 nucleic acid, 58 cases (87.9%) had abnormal chest computed tomography (CT), and 11 cases (16.7%) had sinus arrhythmia. Therefore, for some suspected children with COVID-19, we can make a comprehensive judgment through clinical symptoms, epidemiological history, LYM number, myocardial enzyme spectrum, chest CT, and electrocardiogram; put these children in an isolation ward for treatment; and then transfer them to a general ward for treatment after excluding COVID-19.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32646234>

DOI: 10.1177/0009922820941228

93. Zhu L, Wang J, Huang R, et al. Clinical characteristics of a case series of children with coronavirus disease 2019. Pediatr Pulmonol. 2020;55(6):1430-2. DOI: 10.1002/ppul.24767

ABSTRACT: We reported the clinical characteristics of a case series of 10 patients with coronavirus disease 2019 (COVID-19) aged from 1 year to 18 years. Seven patients had contact with confirmed COVID-19 family members

before onset. Fever (4 [40.0%]) and cough (3 [30.0%]) were the most common symptoms. No patient showed leucopenia and lymphopenia on admission. Pneumonia was observed in chest CT images in 5 (50.0%) patients. Five (50.0%) patients received antiviral treatment. No patient had severe complications or developed a severe illness in our study. Our study indicated that COVID-19 children present less severe symptoms and have better outcomes.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32270592>

DOI: 10.1002/ppul.24767

94. Zimmermann P, Curtis N. Coronavirus Infections in Children Including COVID-19: An Overview of the Epidemiology, Clinical Features, Diagnosis, Treatment and Prevention Options in Children. The Pediatric infectious disease journal. 2020;39(5):355-68. DOI: 10.1097/INF.0000000000002660

ABSTRACT: Coronaviruses (CoVs) are a large family of enveloped, single-stranded, zoonotic RNA viruses. Four CoVs commonly circulate among humans: HCoV-229E, -HKU1, -NL63 and -OC43. However, CoVs can rapidly mutate and recombine leading to novel CoVs that can spread from animals to humans. The novel CoVs severe acute respiratory syndrome coronavirus (SARS-CoV) emerged in 2002 and Middle East respiratory syndrome coronavirus (MERS-CoV) in 2012. The 2019 novel coronavirus (SARS-CoV-2) is currently causing a severe outbreak of disease (termed COVID-19) in China and multiple other countries, threatening to cause a global pandemic. In humans, CoVs mostly cause respiratory and gastrointestinal symptoms. Clinical manifestations range from a common cold to more severe disease such as bronchitis, pneumonia, severe acute respiratory distress syndrome, multi-organ failure and even death. SARS-CoV, MERS-CoV and SARS-CoV-2 seem to less commonly affect children and to cause fewer symptoms and less severe disease in this age group compared with adults, and are associated with much lower case-fatality rates. Preliminary evidence suggests children are just as likely as adults to become infected with SARS-CoV-2 but are less likely to be symptomatic or develop severe symptoms. However, the importance of children in transmitting the virus remains uncertain. Children more often have gastrointestinal symptoms compared with adults. Most children with SARS-CoV present with fever, but this is not the case for the other novel CoVs. Many children affected by MERS-CoV are asymptomatic. The majority of children infected by novel CoVs have a documented household contact, often showing symptoms before them. In contrast, adults more often have a nosocomial exposure. In this review, we summarize epidemiologic, clinical and diagnostic findings, as well as treatment and prevention options for common circulating and novel CoVs infections in humans with a focus on infections in children.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32310621>

DOI: 10.1097/INF.0000000000002660

95. Zimmermann P, Curtis N. COVID-19 in Children, Pregnancy and Neonates: A Review of Epidemiologic and Clinical Features. The Pediatric infectious disease journal. 2020;39(6):469-77. DOI: 10.1097/INF.0000000000002700

ABSTRACT: The novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) pandemic has spread rapidly across the globe. In contrast to initial reports, recent studies suggest that children are just as likely as adults to become infected with the virus but have fewer symptoms and less severe disease. In this review, we summarize the epidemiologic and clinical features of children infected with SARS-CoV-2 reported in pediatric case series to date. We also summarize the perinatal outcomes of neonates born to women infected with SARS-CoV-2 in pregnancy. We found 11 case series including a total of 333 infants and children. Overall, 83% of the children had a positive contact history, mostly with family members. The incubation period varied between 2 and 25 days with a mean of 7 days. The virus could be isolated from nasopharyngeal secretions for up to 22 days and from stool for more than 30 days. Co-infections were reported in up to 79% of children (mainly mycoplasma and influenza). Up to 35% of children were asymptomatic. The most common symptoms were cough (48%; range 19%-100%), fever (42%; 11%-100%) and pharyngitis (30%; 11%-100%). Further symptoms were nasal congestion, rhinorrhea, tachypnoea, wheezing, diarrhea, vomiting, headache and fatigue. Laboratory test parameters were only minimally altered. Radiologic findings were unspecific and included unilateral or bilateral

infiltrates with, in some cases, ground-glass opacities or consolidation with a surrounding halo sign. Children rarely needed admission to intensive care units (3%), and to date, only a small number of deaths have been reported in children globally. Nine case series and 2 case reports described outcomes of maternal SARS-CoV-2 infection during pregnancy in 65 women and 67 neonates. Two mothers (3%) were admitted to intensive care unit. Fetal distress was reported in 30% of pregnancies. Thirty-seven percent of women delivered preterm. Neonatal complications included respiratory distress or pneumonia (18%), disseminated intravascular coagulation (3%), asphyxia (2%) and 2 perinatal deaths. Four neonates (3 with pneumonia) have been reported to be SARS-CoV-2 positive despite strict infection control and prevention procedures during delivery and separation of mother and neonates, meaning vertical transmission could not be excluded.

URL: <https://www.ncbi.nlm.nih.gov/pubmed/32398569>

DOI: 10.1097/INF.0000000000002700

SEARCH STRATEGIES

Database: Embase <1974 to 2020 July 30>

Search Strategy:

- 1 exp Coronavirinae/ or exp Coronavirus infection/ (25656)
- 2 (coronavirus disease 2019 or severe acute respiratory syndrome coronavirus 2).sh,dj. (31915)
- 3 ((corona* or corono*) adj1 (virus* or viral* or virinae*)).ti,ab,kw. (1193)
- 4 (coronavirus* or coronovirus* or coronavirinae* or CoV).ti,ab,kw. (34016)
- 5 ("2019-nCoV" or 2019nCoV or nCoV2019 or "nCoV-2019" or "COVID-19" or COVID19 or "CORVID-19" or CORVID19 or "WN-CoV" or WNCov or "HCoV-19" or HCoV19 or "2019 novel*" or Ncov or "n-cov" or "SARS-CoV-2" or "SARSCoV-2" or "SARSCoV2" or "SARS-CoV2" or SARSCov19 or "SARS-Cov19" or "SARSCov-19" or "SARS-Cov-19" or Ncovor or Ncorona* or Ncorono* or NcovWuhan* or NcovHubei* or NcovChina* or NcovChinese* or SARS2 or "SARS-2" or SARScoronavirus2 or "SARS-coronavirus-2" or "SARScoronavirus 2" or "SARS coronavirus2" or SARScoronavirus2 or "SARS-coronavirus-2" or "SARScoronavirus 2" or "SARS coronavirus2").ti,ab,kw. (35814)
- 6 (respiratory* adj2 (symptom* or disease* or illness* or condition*) adj10 (Wuhan* or Hubei* or China* or Chinese* or Huanan*)).ti,ab,kw. (606)
- 7 (("seafood market*" or "food market*" or pneumonia*) adj10 (Wuhan* or Hubei* or China* or Chinese* or Huanan*)).ti,ab,kw. (1634)
- 8 ((outbreak* or wildlife* or pandemic* or epidemic*) adj1 (Wuhan* or Hubei* or China* or Chinese* or Huanan*)).ti,ab,kw. (129)
- 9 "severe acute respiratory syndrome*".ti,ab,kw. (9092)
- 10 1 or 2 or 3 or 4 or 5 or 6 or 7 or 8 or 9 (65340)
- 11 exp *epidemiology/ or epidemiol*.tw,kw. or ep.fs. (1703491)
- 12 exp disease exacerbation/ (117002)
- 13 ((disease or clinical or illness) adj2 (course or trajector* or characteristi* or progress*)).ti,ab,kw. (495720)
- 14 (natural adj2 histor*).ti,ab,kw. (68676)
- 15 exp probability/ or ((rate* or trend* or likelihood or probabilit* or proportion) adj2 (symptom* or asymptom* or mortali* or death* or hospitali*)).ti,ab,kw. (376912)
- 16 (sever* adj3 case?).ti,ab,kw. (88317)
- 17 11 or 12 or 13 or 14 or 15 or 16 (2644133)
- 18 exp *pediatrics/ or exp *infant/ or exp *child/ or exp *juvenile/ or exp *adolescent/ (241401)
- 19 (child? or children or childhood or p?ediatric* or baby or babies or newborn? or new-born? or neonat* or perinat* or infant? or infantile or infancy or toddler? or preschooler? or pre-schooler* or boy? or girl? or adolescen* or teen* or youth? or juvenile? or pre-menarch* or pre-adolescen* or pre-teen or pre-pubert* or pre-pubesc* or premenarch* or preadolesc* or preteen or prepubert* or prepubesc*).ti. (1703354)

20 18 or 19 (1751602)
21 10 and 17 and 20 (967)
22 limit 21 to (english language and yr="2019 -Current") (476)
23 from 22 keep 3,33,39,41,45,47,52-53,56,83,85-86,96,99,103,106,110,112,114,130,133-
134,141,148,169,177-178,187,221-
222,228,239,245,247,253,255,263,273,281,293,296,313,316,320,322,343,345,347,370,381,410,413-
414,419,426,447 (56)

Database: Ovid MEDLINE(R) <1946 to July Week 3 2020>

Search Strategy:

1 exp coronavirus/ (21816)
2 exp Coronavirus Infections/ (21940)
3 ((corona* or corono*) adj1 (virus* or viral* or virinae*)).ti,ab,kw,kf. (785)
4 (coronavirus* or coronovirus* or coronavirinae* or CoV).ti,ab,kw,kf. (17429)
5 ("2019-nCoV" or 2019nCoV or nCoV2019 or "nCoV-2019" or "COVID-19" or COVID19 or "CORVID-19" or
CORVID19 or "WN-CoV" or WNCov or "HCoV-19" or HCoV19 or "2019 novel*" or Ncov or "n-cov" or "SARS-CoV-
2" or "SARSCoV-2" or "SARSCoV2" or "SARS-CoV2" or SARSCov19 or "SARS-Cov19" or "SARSCov-19" or "SARS-
Cov-19" or Ncovor or Ncorona* or Ncorono* or NcovWuhan* or NcovHubei* or NcovChina* or NcovChinese* or
SARS2 or "SARS-2" or SARSCoronavirus2 or "SARS-coronavirus-2" or "SARSCoronavirus 2" or "SARS coronavirus2"
or SARSCoronavirus2 or "SARS-coronavirus-2" or "SARSCoronavirus 2" or "SARS coronavirus2").ti,ab,kw,kf.
(11863)
6 (respiratory* adj2 (symptom* or disease* or illness* or condition*) adj10 (Wuhan* or Hubei* or China* or
Chinese* or Huanan*)).ti,ab,kw,kf. (400)
7 (("seafood market*" or "food market*" or pneumonia*) adj10 (Wuhan* or Hubei* or China* or Chinese* or
Huanan*)).ti,ab,kw,kf. (989)
8 ((outbreak* or wildlife* or pandemic* or epidemic*) adj1 (Wuhan* or Hubei* or China* or Chinese* or
Huanan*)).ti,ab,kw. (186)
9 "severe acute respiratory syndrome*".ti,ab,kw,kf. (5688)
10 or/1-9 (32324)
11 exp *Epidemiology/ or epidemiol*.tw,kw,kf. or ep.fs. (1826953)
12 exp disease progression/ (179447)
13 ((disease or clinical or illness) adj2 (course or trajector* or characteristi* or progress*)).tw,kf. (255820)
14 (natural adj2 histor*).tw,kf. (43889)
15 exp Probability/ or ((rate* or trend* or likelihood or probabilit* or proportion) adj2 (symptom* or
asymptom* or mortali* or death* or hospitali*)).tw,kf. (1507539)
16 (sever* adj3 case?).tw,kf. (52473)
17 11 or 12 or 13 or 14 or 15 or 16 (3144581)
18 exp *Pediatrics/ or exp *Infant/ or exp *Child/ or *Adolescent/ (110431)
19 (child? or children or childhood or p?ediatric* or baby or babies or newborn? or new-born? or neonat* or
perinat* or infant? or infantile or infancy or toddler? or preschooler? or pre-schooler* or boy? or girl? or
adolescen* or teen* or youth? or juvenile? or pre-menarch* or pre-adolescen* or pre-teen or pre-pubert* or
pre-pubesc* or premenarch* or preadolescen* or preteen or prepubert* or prepubesc*).ti. (1323700)
20 18 or 19 (1346360)
21 10 and 17 and 20 (824)
22 limit 21 to (english language and yr="2019 -Current") (323)
23 from 22 keep 10,21,46,56-59,61-62,73,88,94,97,109,121-122,126,130,145-
146,151,155,158,160,179,188,193,198,200,209,249,251,255,262-264,281,283,286,293,295-297,303,309 (45)

Pubmed – July 30, 2020

#	Query	Results	Time
5	((#1) AND (#2)) AND (#3) in the last year	106	18:05:35
4	((#1) AND (#2)) AND (#3)	106	18:05:28
3	((((((((((disease progression[MeSH Terms]) OR (disease progression*[Text Word])) OR (clinical course[Text Word])) OR (disease timeline[Text Word])) OR (natural history[Text Word])) OR (disease course[Text Word])) OR (clinical timeline[Text Word])) OR (infection time[Text Word])) OR (illness progression[Text Word]))	348,007	18:03:46
2	((((((((((((((((((adolescent[MeSH Terms]) OR (child[MeSH Terms])) OR (infant[MeSH Terms])) OR (child, preschool[MeSH Subheading])) OR (infant, newborn[MeSH Subheading])) OR (infant*[Text Word])) OR (paediatric[Text Word])) OR (paediatrics[Text Word])) OR (pediatric[Text Word])) OR (pediatrics[Text Word])) OR (toddler*[Text Word])) OR (child[Text Word])) OR (children[Text Word])) OR (teen*[Text Word])) OR (adolescent*[Text Word])) OR (youth*[Text Word])) OR (preteen*[Text Word])) OR (preschooler*[Text Word]))	4,037,727	18:01:15
1	((wuhan[tw] AND (coronavirus[tw] OR corona virus[tw])) OR coronavirus*[ti] OR COVID*[tw] OR nCov[tw] OR 2019 ncov[tw] OR novel coronavirus[tw] OR novel corona virus[tw] OR covid-19[tw] OR SARS-COV-2[tw] OR Severe Acute Respiratory Syndrome Coronavirus 2[tw] OR coronavirus disease 2019[tw] OR corona virus disease 2019[tw] OR new coronavirus[tw] OR new corona virus[tw] OR new coronaviruses[all] OR novel coronaviruses[all] OR "Severe Acute Respiratory Syndrome Coronavirus 2"[nm] OR 2019 ncov[tw] OR nCov 2019[tw] OR SARS Coronavirus 2[all]) AND (2019/12[dp]:2020[dp]))	37,727	17:57:02

Google Advanced – July 29, 2020, July 30, 2020

(pediatric|pediatrics|infant|infants|toddler|toddlers|child|children|teen|teens|adolescent|adolescents|youth|youths) AND (COVID-19 OR SARS-Cov-2) AND ("natural history"|"disease course"|"disease progression")