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Original Article

Confirmed Cases of COVID-19 among Children: A Multicenter Study in Kuwait

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Abstract

Background: Children represent a growing proportion of confirmed COVID-19 cases. While pediatric COVID-19 is generally milder than in adults, gaps remain in understanding its epidemiology in Kuwait. This study aimed to determine the incidence, symptom prevalence, severity, and outcomes of COVID-19 among children in Kuwait.

Patients and Methods: A retrospective cohort study analyzed confirmed pediatric cases diagnosed in Kuwait from January to December 2021. Data were sourced from [1] the Ministry of Health database for national incidence estimates, [2] digital records from ten COVID-19 centers across all governorates, and [3] hospital files from Farwaniya Hospital. Clinical presentation, comorbidities, severity, and outcomes were assessed. The incidence rate was calculated using Public Authority for Civil Information [PACI] population data.

Results: The estimated incidence of COVID-19 among children in 2021 was 4,391 cases per 100,000 children [4.39%]. Nearly half of confirmed cases were asymptomatic. Hospitalization was required for 3.2% of pediatric cases in Farwaniya governorate, with respiratory symptoms being most common. Comorbidities were present in 29.4% of hospitalized children, most commonly congenital anomalies.

Conclusion: Most pediatric COVID-19 cases in Kuwait were mild or asymptomatic, with low hospitalization rates. However, children with moderate or severe disease were more likely to have comorbidities. These findings highlight the need for continued surveillance and targeted public health strategies to protect vulnerable pediatric populations.

Keywords: COVID-19; Children; Incidence; Kuwait; Symptoms.

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INTRODUCTION

The novel coronavirus disease 2019 [COVID-19], caused by severe acute respiratory syndrome coronavirus 2 [SARS-CoV-2], has been a significant global public health challenge, leading to substantial morbidity and mortality and overwhelming healthcare systems worldwide [1]. As of January 12, 2025, the number of confirmed COVID-19 cases worldwide had risen to 777,315,739, with 7,083,869 deaths reported. In Kuwait, the total confirmed cases reached 667,000, with 2,600 deaths [2].

While COVID-19 primarily affects adults, children are also susceptible to infection, even though at lower rates and with generally milder disease severity [3]. Globally, the proportion of pediatric cases among confirmed COVID-19 cases ranges from 1% to 5% [4].

Early reports from Kuwait documented that children accounted for approximately 3.3% of all COVID-19 cases between February and April 2020 [5]. However, this percentage may be underestimated, as asymptomatic infections among children often go undiagnosed, with testing primarily conducted in cases of moderate to severe symptoms [6].

By 2021, children represented 15.6% of all confirmed COVID-19 cases in Kuwait according to Kuwaiti MOH, highlighting the evolving epidemiological landscape of pediatric infections in the country. The clinical presentation of COVID-19 in children varies widely, from asymptomatic cases to respiratory, gastrointestinal, neurological, cardiac, and cutaneous manifestations. Asymptomatic infection rates in children range from 15% to 39% in some studies [7,8] and as high as 63.4% to 73.3% in others [3,9,10].

Most pediatric COVID-19 are mild or asymptomatic [4,6,11,12], with a generally low fatality rate among children under 18 years of age [11]. However, severe disease requiring hospitalization and intensive care does occur, particularly among children with preexisting comorbidities such as asthma [33.6%], obesity [19.4%], congenital malformations [10.8%], neuro-developmental disorders [8.8%], heart disease [13.1%], type 1 diabetes mellitus [0.5%], cancer [4%], and chromosomal disorders [1.3%] [13].

Other risk factors for severe disease include prematurity, seizure disorders, immunocompromised status, chronic lung diseases other than asthma, and sickle cell disease [1,14]. A rare but serious complication associated with pediatric COVID-19 is multisystem inflammatory syndrome in children [MIS-C], characterized by systemic inflammation occurring 2–6 weeks post-infection, even in children without underlying comorbidities [15].

Despite Kuwait's robust public health surveillance system, gaps remain in understanding pediatric COVID-19, particularly in incidence, symptoms, and disease burden across age groups. Effective surveillance is crucial for tracking trends, monitoring morbidity, detecting variants, and assessing long-term complications. It helps identify risks, evaluate interventions, and tailor public health measures to protect children [16].

This study aims to determine COVID-19 incidence in Kuwaiti children, analyze symptom prevalence, assess disease severity, and evaluate its overall health impact. Findings can help policymakers convert surveillance data into actionable insights for more effective responses to future pandemics.

METHODS

Study design, duration and setting: This retrospective cohort multicenter study was conducted across three settings in Kuwait. First, national pediatric COVID-19 incidence was estimated using data from the Ministry of Health [MOH], which included confirmed cases from public and private sector laboratories. Second, digital medical records from ten COVID-19 centers across all governorates were analyzed. These centers, established in May 2020, provided consultations, examinations, and necessary treatments. Lastly, hospital data were obtained from digital records and medical files of pediatric patients admitted to Farwaniya Hospital, selected due to logistical constraints.

Study Population and Sample Size: The study included all children under 18 residing in Kuwait with a confirmed COVID-19 diagnosis based on a positive rRT-PCR test in 2021. A total of 48,602 confirmed cases were obtained from MOH records, 25,536 from COVID-19 centers, and 286 hospitalized cases from Farwaniya Hospital.

Data collection and variables: Medical records were reviewed for demographic data, clinical presentation, comorbidities, disease severity, treatment, and outcomes.

1-**Socio-demographic data:** Age, sex, nationality, and residence.

2-**Clinical manifestations:** Categorized as respiratory, gastrointestinal, cutaneous, neurological, cardiac, or other symptoms. MIS-C cases were recorded.

3-**Comorbidities:** Included asthma, diabetes, obesity, congenital malformations, cardiovascular diseases, neuro-developmental disorders, and immunocompromised status.

4-**Disease severity:** Classified into five categories [asymptomatic, mild, moderate, severe, critical] using Chinese National Guidelines [17–19]. These Guidelines were widely recognized internationally during the early stages of the pandemic and provided a comprehensive and systematic approach to classify COVID-19 disease severity

5-Laboratory findings: *Complete Blood Count [CBC]:* White blood cell count [WBC], lymphocyte count, Lymphopenia and Leukocytosis. *Inflammatory markers:* C-reactive protein [CRP], Lactate dehydrogenase [LDH], serum ferritin, procalcitonin, erythrocyte sedimentation rate [ESR] and interleukin-6. *Coagulopathy markers:* D-dimer, and Fibrinogen. *Organ injury biomarkers:* troponin, liver enzymes, pro B-type natriuretic peptide [proBNP] and creatinine kinase-MB.

6. Radiological findings in chest x-ray or CT scan: evidence of pneumonia [Ground-glass opacities GGO, Bilateral infiltrate, or Consolidation].

7-Treatment modalities included supportive care [hydration, antipyretics], symptomatic management [cough suppressants, antihistamines, nasal sprays, bronchodilators], and specific therapies such as steroids [dexamethasone], antibiotics, antivirals [remdesivir], neutralizing monoclonal antibodies [sotrovimab], convalescent plasma, and oxygen therapy. Outcomes were categorized as full recovery, hospital or ICU admission, complications [MIS-C], or death.

8-Outcomes: Categorized as full recovery, hospital/ICU admission, complications, or death.

Incidence rate calculation: Incidence proportion or cumulative incidence was determined as confirmed cases per 100,000 children, using population data from the Public Authority for Civil Information [PACI]. The total population of children [0–18 years] was 1,106,965, with adolescents aged 19 included per PACI classification. The study covered confirmed COVID-19 cases in the period from March 1, 2020, to March 31, 2021

Statistical analysis: Statistical Package for Social Sciences [SPSS] version 30 was used for data analysis. Qualitative data were presented as numbers [N] and relative frequencies [%]. For quantitative data, the Kolmogorov–Smirnov test [or Shapiro Wilk test for normality] was also used to assess the normality of quantitative data and medians with interquartile ranges [IQR] were used to describe non-parametric ones. Missing data were not replaced, and a complete case analysis was performed.

RESULTS

For data analysis, our study is composed of three data settings divided into three sections:

First: The total confirmed pediatric cases in Kuwait [MOH data]: After applying inclusion and exclusion criteria, there were 48,602 pediatric confirmed cases of COVID-19 in Kuwait. During the year 2021 in Kuwait, among almost four million swabs performed for adults, 263,898 swabs were positive. Whereas in children, out of 773,854 swabs taken from children, 48,602 were positive. Among 312,500 positive swabs, children accounted for 15.6% [N=48,602] of all confirmed cases of COVID-19 in Kuwait in 2021 **[Figure 1]**. Thus, the incidence of COVID-19 among children was 4,391 cases per 100,000 children [4.39%]. Incidence increased with age. In the age groups of 0-4, 5-9, 10-14, and 15-19, the calculated incidence was 1463, 2877, 5634, and 7691 cases per 100,000 children, respectively. Regarding governorate, the most frequently reported cases were in Ahmadi governorate [27.4%], followed by Hawally [21.3%], Farawaniya [18.6%], Capital [16.9%], and Jahra [15.7%] **[Table 1].**

Second: Confirmed COVID-19 Pediatric Cases in the ten Kuwaiti COVID Centers

In 2021, 25,536 of 48,602 eligible pediatric cases [52.2%] who had visited COVID-19 centres were included in this study. Sociodemographic characteristics of COVID-19 confirmed cases among children in COVID-19 centres were presented in **Supplementary Table S1**. Among them, the vast majority of children were previously healthy [N=25,234; 98.8%], and approximately only 1.2% [N=302] had comorbidities, mainly asthma [N=203, 0.8%]**.**

The prevalence of asymptomatic COVID-19 in children was 48.0%. **Figure [2]** demonstrates the most frequently recorded symptom was cough [43.1%] affecting almost half of children, followed by fever [28.2%]. Other common symptoms reported were: loss of smell and/or taste [25%], headache [24.5%], rhinorrhea [19.5%], sore throat [19.1%], and myalgia [12.0%]. Gastrointestinal symptoms were less reported affecting less than 5% of children. Other documented symptoms were fatigue [1.5%], nasal congestion and sneezing [1.5%], dyspnea [1.2%], dizziness [0.6%], and chest pain [0.2%]. The least recorded symptom that occurred in < 0.1% of cases was skin rash.

Age disaggregation of symptoms revealed that cough was reported in approximately 40% of cases across all age groups. Children under 10 years more frequently presented with fever [68.6% in <1 year, 54.8% in 1–4 years, 43.3% in 5–9 years], rhinorrhea [27.1%–22.6%], and diarrhea [14.3%–5.6%]. In contrast, older children [10–18 years] commonly experienced sore throat [19.8%–20.0%], headache [22.9%–27.8%], loss of taste/smell [21.4%–30.5%], and myalgia [10.0%–14.6%]. Fatigue was most frequent among 10–14-year-olds [14.4%] and rare in other groups [<2%] **[Supplementary Table S2]**.

Regarding COVID-19 severity, almost half [48%] were asymptomatic. However, only a small proportion of symptomatic children had moderate [0.7%] or severe [0.05%] form of disease, whereas more than half [51.25%] had mild disease. No critical cases were detected **[Table 2].**

Third: Confirmed COVID-19 Pediatric Cases Admitted in Farwaniya Hospital

In Kuwait, during the year of 2021, the total number of children admitted to Farwaniya hospital was 286 cases, constituting 3.2% of the total confirmed pediatric cases in Farwaniya governorate [9,023]. Details about sociodemographic characteristics of the COVID-19 confirmed cases in children who were admitted to Farwaniya Hospital were presented in **Supplementary Table S3**.

Among hospitalized children, the proportion of comorbidities accounts for 29.4% of COVID-19 children. Among them, the commonly reported comorbidities were congenital anomalies [35.7%], Gastroesophageal reflux disease/ GERD [20.2%], epilepsy [19%], diabetes mellites [15.5%], renal disease [15.5%], bronchial asthma [11.9%], and hypothyroidism [8.3%], **Table 3**.

Respiratory symptoms were the predominant symptoms presented among children admitted to the hospital. The two most frequently reported symptoms were fever and cough, which occurred in 61.3% and 46.6% of children respectively. Other respiratory symptoms presented were rhinorrhea [12.6%], shortness of breath [8.8%], sore throat [5%], and nasal congestion [2.9%]. GI symptoms that occurred in children were nausea &/or vomiting [21.8%], diarrhoea [13%], and abdominal pain [12.2%]. Fatigue, headache, and myalgia were reported in 4.2%, 3.8%, and 2.9% of hospitalized children respectively.

Other symptoms that were infrequently reported include syncope [2.5%], skin rash [2.5%], chest pain [2.1%], and dizziness [0.8%]. Two of the symptomatic children [0.8%] were diagnosed as cases of MIS-C, **Figure 3**.

Asymptomatic patients who were admitted to the hospital for other reasons [e.g. childbirth/delivery, or surgical procedure] and were incidentally diagnosed with COVID-19 infection accounted for 16.4%. Regarding severity, more than half of hospitalized children [59.8%] were mild cases. Moderate and severe cases were uncommon, representing 15% and 8.7% respectively. In our study, there were no critical cases. The length of hospital stay ranged from 1 to 54 days, with a median of 3 days and Interquartile range [IQR: 1-2]. The vast majority of hospitalized pediatric cases needed no ICU admission [95.1%]. Only 4.9% of children were admitted to the pediatric ICU. Regarding hospital discharge, the majority of admitted cases were discharged routinely after recovery [85.3%]. The total proportion of children who were transferred to another hospital for further care was 9.1%. About 4.9% were discharged on patient demand against medical advice. Only 2 cases of hospitalized children had died [0.7%] [**Table 4].**

Regarding Laboratory and Radiological Findings, leukocytosis was reported in 56.3% of cases, while leukopenia was rare [3.1%]. Lymphopenia occurred in 39.2% of hospitalized children. Elevated inflammatory markers were noted, with CRP and ESR raised in 41.5% and 60% of cases, respectively. Increased D-dimer and fibrinogen were found in 2.1% and 54.5% of cases. Thrombocytopenia was seen in 6.7%, and troponin elevation occurred in 1.4% of children. Abnormal chest radiological findings were observed in 6.0% of cases, with lung infiltrates in 5.2%. Consolidation and ground-glass opacities were each seen in 0.4% of cases [**Table 5].**

The treatment Modalities investigation revealed that supportive care was provided to 53.5% of children, while 36.3% received symptomatic treatment. Other treatments were administered in 7.7% of cases. Only one child [0.3%] was discharged with home oxygen, and 2.1% required no treatment [**Table 6].**

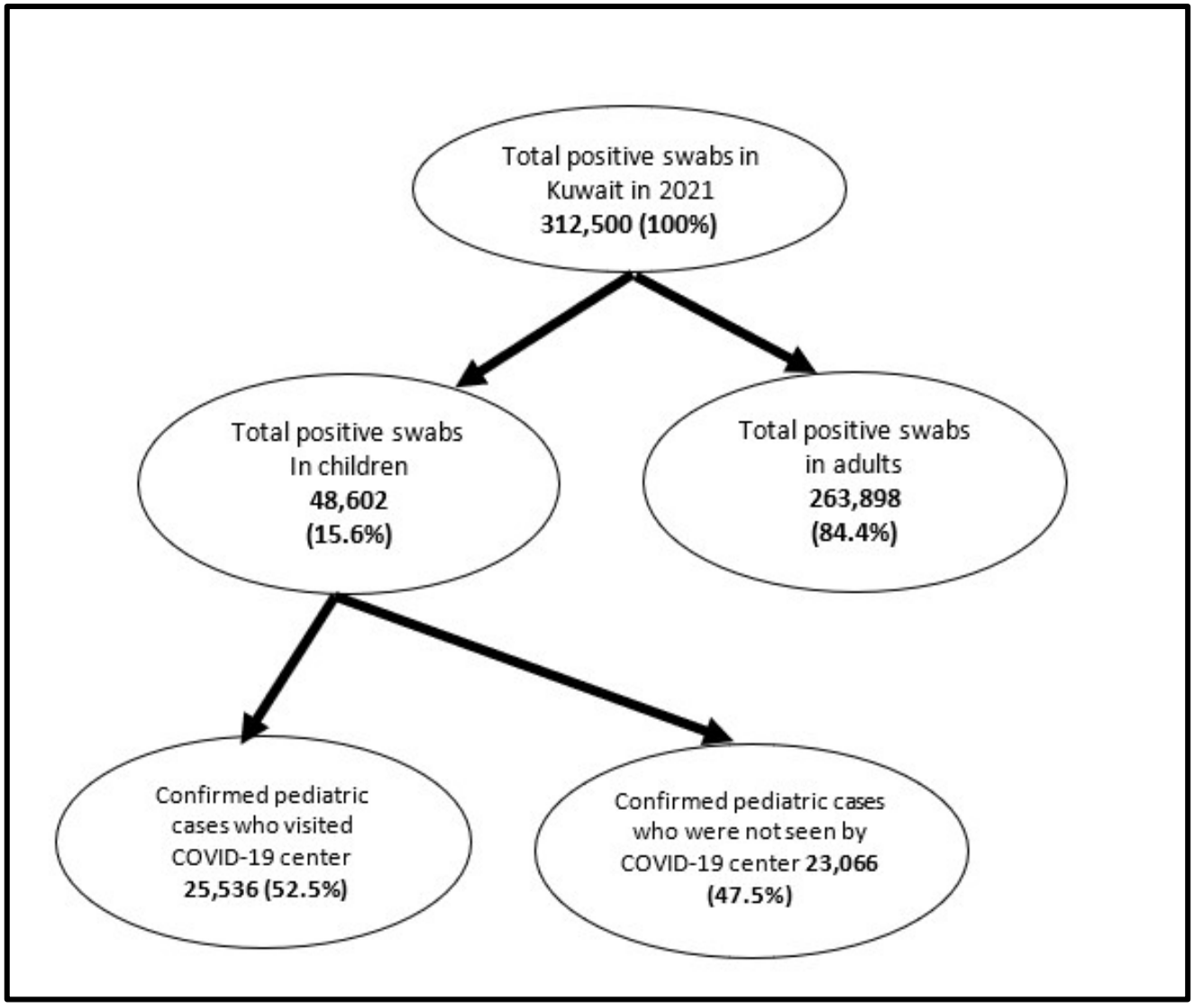

Figure [1]: Flowchart demonstrates the confirmed COVID -19 cases in Kuwait based on Ministry of Health data.

Table [1]: Incidence of COVID-19 Confirmed Cases

		Confirmed Cases	Pediatric Population	Incidence
Total		48,602	1,106,965	4.39% [4,391 cases per 100,000 children]
Age Groups [Years]	0-4	3,824	261,233	1.46% [1,463 cases per 100,000 children]
	5-9	8,530	296,412	2.88% [2,877 cases per 100,000 children]
	10-14	16,433	291,686	5.63% [5,634 cases per 100,000 children]
	15-19	19,815	257,634	7.69% [7,691 cases per 100,000 children]
Nationality	Kuwaiti	37,768 [77.7%]	652,748	5.77% [5,786 per 100,000 children]
	Non- Kuwaiti	10,834 [22.3%]	454,217	2.34% [2,385 per 100,000 children]
Governorate	Ahmadi	13,340		**% [100]***
	Hawally	10,328		27.4%
	Farwaniya	9,023		21.3%
	Capital	8,232		18.6%
	Jahra	7,621		16.9%
	Unknown	58		15.7%

*Percentage was calculated based on total confirmed COVID-19 cases [48,602]

Table [S1]: Sociodemographic Characteristics of COVID-19 Confirmed Cases Among Children in COVID-19 Centers

	Sociodemographic Characteristics	No. [25,536]	% [100]
Gender	Male	12,404	48.6%
	Female	13,132	51.4%
Age group	<1	330	1.3%
	1-4	901	3.5%
	5-9	1,380	5.4%
	10-14	9,930	38.9%
	15-18	12,995	50.9%
Nationality	Kuwaiti	19,334	75.7%
	Non- Kuwaiti	6,202	24.3%
	Nationality of non-Kuwaiti	**6,202**	**100%**
	Egypt	1,375	22.2%
	Saudi Arabia	886	14.3%
	India	759	12.2%
	Syria	555	8.9%
	Jordan	409	6.6%
	Lebanon	284	4.6%
	Iraq	140	2.3%
	Pakistan	131	2.1%
	Iran	128	2.0%
	Yemen	77	1.2%
	Philippines	67	1.1%
	Palestine	60	1.0%
	Other Countries	59	21.5%
Governorate Health Regions	Ahmadi	6,265	24.5%
	Hawally	5,733	22.5%
	Farwaniya	5,021	19.7%
	Capital	4,676	18.3%
	Jahra	3,841	15.0%

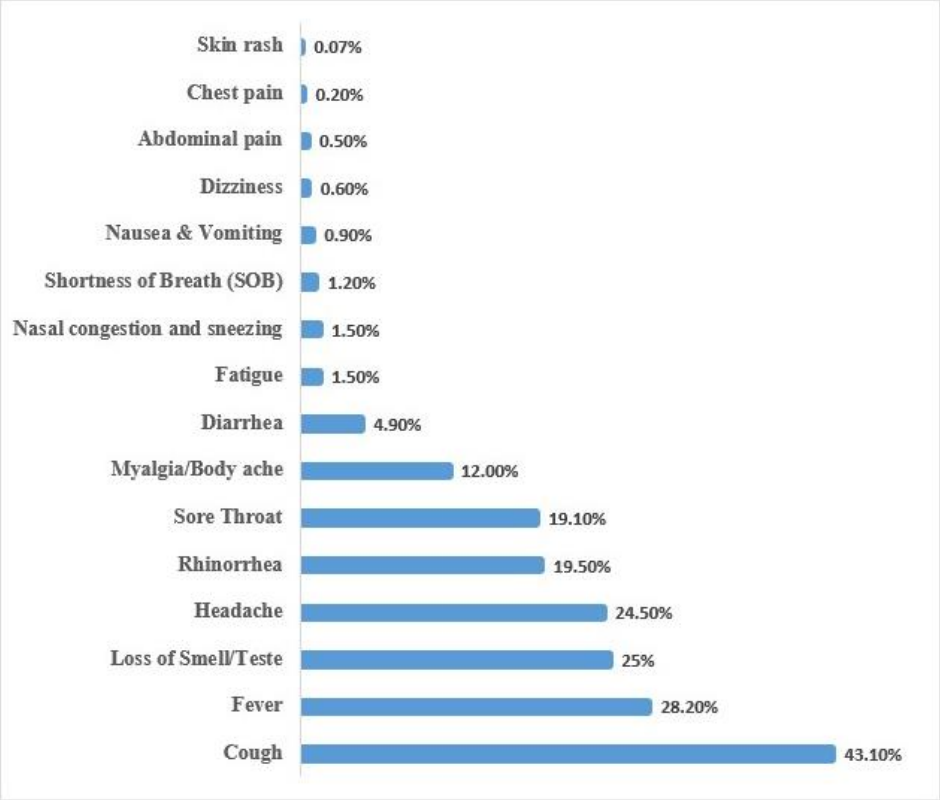

Figure [2]: Symptoms Distribution among confirmed Cases in COVID-19 Centers

Table [S2]: Distribution of Symptoms across Different Age groups of COVID-19 Confirmed Cases in COVID-19 Centers

Symptom	[Age groups [years] [N									
	[<1 [140		[1-4 [394		[5-9 [518		[10-14 [4921		[15-18 [7308	
	N	%	N	%	N	%	N	%	N	%
Fever	96	68.6%	216	54.8%	225	43.4%	1353	27.5%	1859	25.4%
Cough	62	44.3%	170	43.1%	187	36.1%	2150	43.7%	3155	43.2%
Sore Throat	2	1.4%	10	2.5%	87	16.8%	974	19.8%	1458	20.0%
Rhinorrhea	38	27.1%	102	25.9%	117	22.6%	1062	21.6%	1264	17.2%
Nasal congestion	4	2.9%	6	1.5%	4	0.8%	88	1.8%	94	1.3%
Shortness of Breath	0	0.0%	2	0.5%	0	0.0%	43	0.9%	114	1.6%
Diarrhea	20	14.3%	56	14.2%	29	5.6%	225	4.6%	315	4.3%
Nausea/ Vomiting	0	0.0%	4	1.0%	0	0.0%	37	0.8%	79	1.1%
Abdominal Pain	2	1.4%	0	0.0%	11	2.1%	35	0.7%	14	0.2%
Headache	0	0.0%	2	0.5%	99	19.1%	1126	22.9%	2030	27.8%
Loss of Smell/Taste	0	0.0%	2	0.5%	34	6.6%	1051	21.4%	2231	30.5%
Myalgia/Bodyache	0	0.0%	6	1.5%	30	5.8%	494	10.0%	1065	14.6%
Fatigue	0	0.0%	2	0.5%	2	0.4%	71	14.4%	128	1.8%
Chest Pain	0	0.0%	0	0.0%	0	0.0%	4	0.1%	16	0.2%
Skin Rash	0	0.0%	6	1.5%	0	0.0%	3	0.1%	0	0.0%

N.B. The total percentages exceeded 100% as the patient may have more than one symptom

Table [2]: Severity of COVID-19 among Confirmed Cases in COVID-19 Centers

Severity	[No. [25,536	[% [100
Asymptomatic	12,255	48.0%
Mild	13,089	51.25%
Moderate	179	0.7%
Severe	13	0.05%
Critical	0	0.0%

Table [S3]: Sociodemographic Characteristics Among COVID-19 Confirmed Cases Admitted in Farwaniya Hospital

Sociodemographic Characteristics		[No. [286	[% [100
Gender	Male	173	60.5%
	Female	113	39.5%
Age Median: IQR [25%-75%]		[10 [2-16	
Age groups	<1	46	16.1%
	1-4	55	19.2 %
	5-9	36	12.6%
	10-14	57	19.9%
	15-18	92	32.2%
Nationality	Kuwaiti	164	57.3%
	Non- Kuwaiti	122	42.7%

Table [3]: Comorbidities among COVID-19 Confirmed Cases Admitted in Farwaniya Hospital

Comorbidities		No. [286]	% [100]
Presence of comorbidities	Yes	**84**	**29.4%**
	No	202	70.6%
Types of Comorbidities	**Total**	**84**	**%***
	Congenital Anomalies	30	35.7%
	GERD [Gastroesophageal Reflux Disease]	17	20.2%
	Epilepsy	16	19.0%
	Diabetes Mellites	13	15.5%
	Renal Disease	13	15.5%
	Bronchial Asthma	10	11.9%
	Hypothyroidism	7	8.3%
	Other Respiratory Disease	6	7.1%
	Chronic Liver Disease	6	7.1%
	Developmental Delay/ Failure to Thrive	4	4.8%
	Systemic Lupus Erythematosus [SLE]	4	4.8%
	Irritable Bowel Disease [IBD]	4	4.8%
	Cerebral Palsy [CP]	4	4.8%
	Congenital Heart Disease	3	3.6%
	Other Heart Disease	3	3.6%
	Anemia	3	3.6%
	Celiac Disease	3	3.6%
	Down's Syndrome	2	2.4%
	Polycystic Ovary Syndrome [PCOS]	2	2.4%
	Obesity	1	1.2%
	Autism	1	1.2%
	Obstructive Sleep Apnea	1	1.2%

**The total percentages exceeded 100% as the patient may have more than one pre-existing medical condition.*

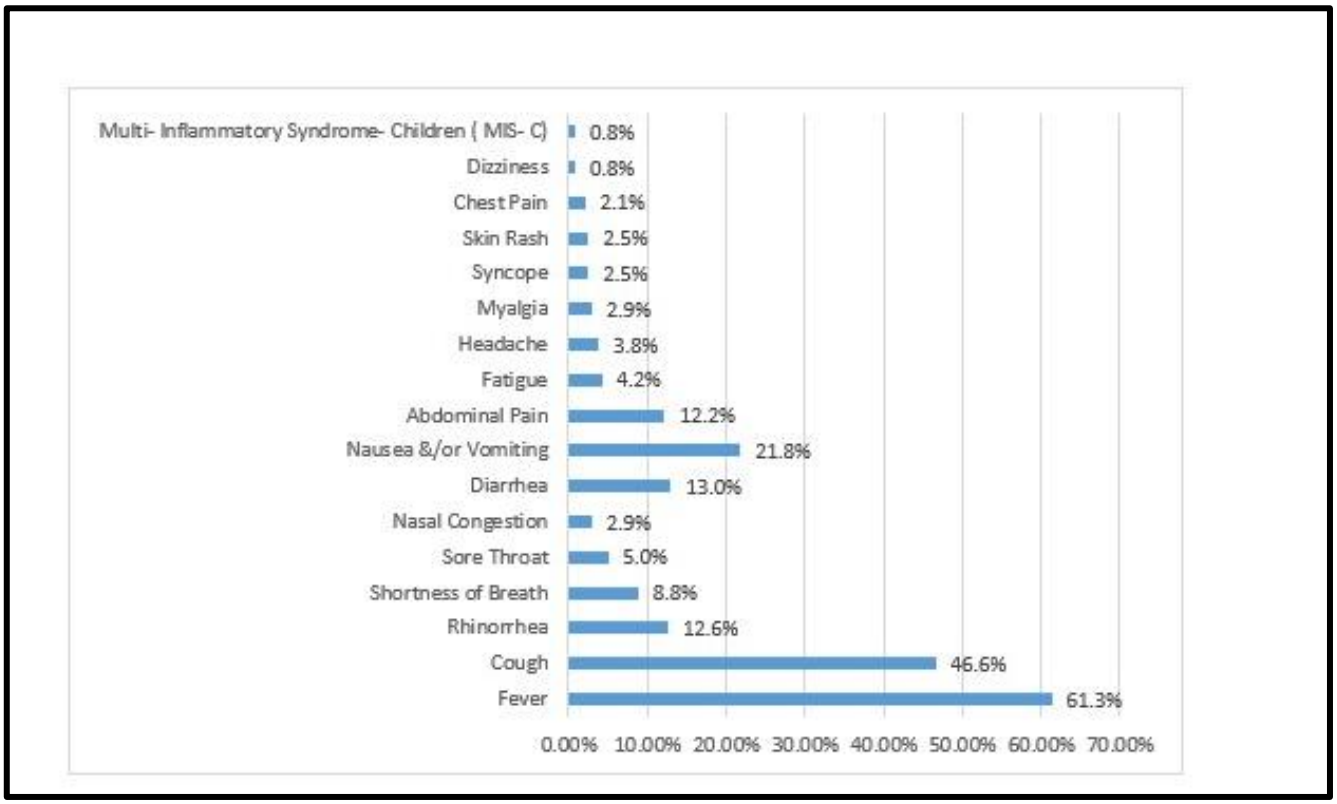

Figure [3]: Symptoms of COVID-19 among Confirmed Cases Admitted in Farwaniya Hospital

Table [4]: Severity of COVID-19, length of hospital stay and disease outcome among Confirmed Cases Admitted in Farwaniya Hospital

Severity	[No. [286	[% [100
Asymptomatic	47	16.4%
Mild	171	59.8%
Moderate	43	15.0%
Severe	25	8.7%
Critical	0	0%
[Length of Hospital Stay [Days	**[No. [286**	**[% [100**
1- 3	243	85%
4- 10	31	10.8%
11- 15	8	2.8%
≥ 16	4	1.4%
[Median [IQR 25%-75%	[3 [IQR: 1-2	
Intensive Care Unit [ICU] Admission	**[No. [286**	**100%**
Yes	14	4.9%
No	272	95.1%
Discharge Type	**[No. [286**	**100%**
Discharged Routinely After Recovery	244	85.3%
Transferred to Other Hospital	26	9.1%
Discharged on Patient Demand	14	4.9%
Death	2	0.7%

Table [5]: Recorded Laboratory Findings and Recorded Radiological Findings among COVID-19 Confirmed Pediatric Cases Admitted in Farwaniya Hospital

	[No. [286	100%
Laboratory Findings		
Leukocytosis	18	62.9%
Leukopenia	1	0.3%
Lymphopenia	29	10.1%
C- Reactive Protein [CRP] - Elevated	34	11.9%
Erythrocyte Sedimentation Rate [ESR] - Elevated	6	2.1%
D- dimer - Elevated	6	2.1%
Fibrinogen - Elevated	18	6.3%
Thrombocytopenia [Low Platelets Count]	4	1.4%
Troponin - Elevated	4	1.4%
Radiological Findings		
Lung infiltration	15	5.2%
Consolidation	1	0.4%
Ground Glass Opacity [GGO]	1	0.4%

Table [6]: Treatment among COVID-19 Confirmed Cases Admitted in Farwaniya Hospital

Treatment	[No. [286	[% [100
None	6	2.1%
Supportive	153	53.5%
Symptomatic	104	36.3%
Other Treatment Options	22	7.7%
Oxygen Therapy	1	0.3%

N.B. Supportive treatment includes IV fluids and antipyretic drugs [paracetamol]. N.B. Symptomatic treatment includes antihistamine, cough suppressant, and nasal drops. N.B. Other treatment options may include: Steroids, Antiviral drugs, Antibiotics, or Monoclonal Antibody.

DISCUSSION

Since the onset of the pandemic through January 12, 2025, COVID-19 has impacted over 777 million individuals globally, resulting in more than seven million deaths [2].

Pediatric COVID1-19 represented expanding problem. Several international studies have provided insight into pediatric COVID-19 epidemiology. **Götzinger *et al.*** [20] conducted a multicenter European study involving 582 children, reporting that 8% required intensive care admission, with underlying conditions significantly increasing the risk of severe disease.

Similarly, CDC surveillance data from the United States highlighted that 23% of hospitalized pediatric patients had at least one underlying condition, and infants were particularly vulnerable [21].

A systematic review by **Ludvigsson** [4] reinforced that severe COVID-19 remains rare among children, and most infections are mild or asymptomatic. However, a study from South Africa during the Omicron wave indicated a rise in pediatric hospitalizations, emphasizing that evolving viral variants may impact clinical outcomes [22].

These findings underscore the importance of continuous monitoring and comparison with global data to better understand disease dynamics across different settings and time periods. Hence, understanding the situation in Kuwait is essential for optimizing healthcare resource allocation and addressing future needs. This study aimed to assess the incidence of COVID-19 among children in Kuwait in 2021, as well as to characterize the symptoms, severity, and outcomes of the disease.

The estimated incidence of COVID-19 among children in Kuwait in this study in 2021 was 4,391 cases per 100,000 children [4.39%]. This figure exceeds that reported in Iran [2.1%] [23] and is significantly higher than the incidence recorded in the USA, which ranged from 3.8 [0.38%] to 7.7 [0.77%] per 1,000 person-weeks in two cities [24].

Additionally, pediatric confirmed cases of COVID-19 in Kuwait constituted 15.6% of all confirmed cases, aligning with rates reported by the American Academy of Pediatrics [25], but exceeding the prevalence reported in various systematic reviews [1% to 5% or 2.6% to 7.1%] [4,13].

The high incidence in Kuwait can be attributed to social behaviors, adherence to Ministry of Health policies, and the accessibility of healthcare services, including convenient testing locations and free swab testing. Mandatory vaccination proof or weekly negative PCR test results for returning students also contributed to increased testing rates, leading to higher reported incidence figures.

The incidence of COVID-19 increased with age among children. The calculated incidence rates for age groups 0-4, 5-9, 10-14, and 15-19 years were 1,463, 2,877, 5,634, and 7,691 cases per 100,000 children, respectively. This trend is consistent with other studies, which noted higher incidence rates among older

age groups [24]. Factors influencing this trend include greater social interactions and less compliance with preventive measures among older children.

In the Farwaniya governorate, 9,023 children were diagnosed with COVID-19 in 2021, with 286 [3.2%] requiring hospitalization. This hospitalization rate is significantly higher than the cumulative incidence of 49.7 per 100,000 children reported in 14 US states [26]. Hospitalization rates varied widely in different studies, ranging from 0.3% to 10% [13,27].

In the present study, the incidence of COVID-19 among Kuwaitis was approximately double that of non-Kuwaitis, at 5,786 and 2,385 per 100,000 children, respectively. This contrasts with neighboring Gulf Cooperation Council [GCC] countries, where expatriates often represented a higher proportion of cases [9,28].

The higher incidence among Kuwaitis may be influenced by different social and cultural behaviors, including larger family gatherings and multi-generational households, which increase transmission potential.

Analysis of residential governorates revealed that approximately one-third of COVID-19 cases originated from Ahmadi Governorate, with other notable cases from Hawally and Farwaniya. This distribution was further confirmed when testing Farwaniya Hospital centre data, indicating higher case proportions in these areas.

The study revealed that the majority of infected children at COVID-19 centres in Kuwait had no pre-existing comorbidities, with asthma identified as the most common comorbidity among the few affected. In hospital settings, congenital anomalies accounted for over one-third of cases at Farwaniya Hospital.

This contrasts with findings from other studies, which reported a proportion of hospitalized children with comorbidities ranging from 7.2% to 43% [8,28].

Given that COVID-19 is often mild in children, those with comorbidities may experience symptoms that overlap with their pre-existing conditions, potentially leading parents to overlook COVID-19 as a cause. Additionally, caregivers of children with comorbidities tend to prioritize managing these primary conditions, which may result in COVID-19 symptoms being missed. Consequently, testing for COVID-19 might not occur until the child's condition worsens significantly.

Among pediatric cases studied, nearly half were asymptomatic, a finding that aligns with two systematic reviews indicating that approximately 50% of COVID-19 cases among children were asymptomatic [1,27].

Cavalcante Pinto Júnior *et al.* [3] and **Jackson *et al.*** [10] reported an even higher proportion of asymptomatic children, suggesting they accounted for the majority of pediatric COVID-19 cases.

In contrast, other studies have documented lower rates of asymptomatic cases, with fewer than 40% of children being asymptomatic [7,8].

It is important to note that the true proportion of asymptomatic COVID-19 cases in children may be underestimated. This potential underreporting could be biased, as children with moderate or severe symptoms are more likely to seek testing [1,6]. Consequently, the prevalence of asymptomatic cases may not be fully captured in available data.

Among symptomatic pediatric cases attending COVID-19 centres, the most common recorded symptoms were fever and cough, aligning with previous research [1,13,27].

It was also observed that these symptoms showed age differences. Rhinorrhea and sore throat were reported in about one-fifth of cases, consistent with some studies but higher than others [3,9,11].

Nasal congestion and dyspnea were less common, with dyspnea occurring at lower rates than in other studies [7,11].

Gastrointestinal symptoms were rare [<5%], though prior research reported diarrhea in up to 20% of cases [13]. Nausea, vomiting and abdominal pain were the least frequent, aligning with other studies [11,27].

Among neurological symptoms, anosmia and ageusia affected up to 25% of cases, higher than Cavalcante Pinto Júnior et al.'s 11% [3]. Headache, reported in nearly one-quarter of cases, ranged from 10% to 60% in various studies [7,9]. Myalgia [12.9%] was lower than the 25%–33% seen elsewhere [11]. Fatigue, chest pain, and skin rash were rare, consistent with other studies [3,4].

Moreover, age differences in COVID-19 presentation were observed. Younger children [<10 years] more often had a fever, rhinorrhoea, and diarrhoea, while older children [10–18 years] commonly experienced a sore throat, headache, loss of taste/smell, and myalgia. Fatigue was most frequent in children aged 10–14 years and rare in other groups. Variations in symptomatology across studies highlight the need for a rigorous and sensitive surveillance system to accurately capture differences.

Our study also examined symptoms in pediatric COVID-19 patients hospitalized at Farwaniya Hospital, compared to those attending COVID-19 centres, hospitalized cases had higher rates of fever, shortness of breath, and gastrointestinal issues like nausea, vomiting, and abdominal pain, compared to children attending COVID-19 centres.

In contrast, neurological symptoms such as headache, anosmia, and ageusia were more common in non-hospitalized cases. While skin manifestations were rare in both groups, MIS-C was reported only in hospitalized patients. These findings highlight the variability in symptom presentation and the need for tailored clinical management of hospitalized and non-hospitalized pediatric patients.

Regarding the severity of COVID-19, the majority of children presented with mild disease, supporting findings from other studies that indicate mild COVID-19 is the most common manifestation in pediatric populations [13,17,27].

Severe cases were infrequently observed, accounting for 8.7% of hospitalized children, a figure that aligns with another study reporting severe disease in 11.0% of cases [26]. However, several studies have documented even lower proportions of severe disease, with rates of less than 4% [28].

Several factors contribute to the generally milder course of COVID-19 in children compared to adults. First, children are less likely to have comorbidities such as diabetes or chronic lung disease, which are associated with more severe illness. Second, children tend to have a more robust innate immune response, which diminishes with age [29]. Third, it is believed that children are primarily infected by adult family members, exposing them to later generations of the virus that may have reduced pathogenicity. Lastly, children are frequently exposed to various coronaviruses during winter months, resulting in higher levels of antibodies against coronaviruses compared to adults [1].

In this study, the majority of hospitalized pediatric COVID-19 cases were mild or asymptomatic, supporting the recommendation for supportive care as the primary treatment approach. Over half received supportive therapy, mainly intravenous fluids and paracetamol. Symptomatic treatment, including cough suppressants, antihistamines, nasal sprays/ drops, and bronchodilators, was administered to more than third of cases. These findings align with previous studies, which reported wide variation in treatment approaches [8,13,30].

Conclusion:

This study provides a comprehensive analysis of pediatric COVID-19 in Kuwait during 2021. Among 48,602 confirmed cases, children comprised 15.6% of all infections, with an incidence of 4,391 per 100,000 [4.39%]. Nearly half were asymptomatic, and only a small proportion had moderate to severe disease. Hospitalization was required for 3.2% of cases in Farwaniya governorate, with fever and cough being the most common symptoms. Congenital anomalies were the most frequent comorbidity among hospitalized children. The overall disease severity was mild, with no critical cases reported. These findings highlight the need for age-specific public health strategies, particularly in vaccination campaigns for older children, and continued surveillance to assess long-term impacts and improve healthcare responses.

Strengths and limitations:

This study's strengths include comprehensive national data from the Ministry of Health and a multicenter approach, ensuring representativeness. Digitalized records improved data management and minimized transcription errors. However, limitations include potential underestimation of incidence due to undiagnosed mild or asymptomatic cases and incomplete data entry affecting some findings' reliability.

Declarations

Ethical Considerations: Before data collection, all necessary approvals were obtained. Ethical approval was granted by the Ethical Committees of the Faculty of Medicine [for Girls], Al-Azhar University-Cairo, and the Ministry of Health [MOH] in Kuwait. Administrative approval, in the form of a "Facilitating Researcher's Mission" document, was secured from MOH and distributed to relevant departments. The research protocol was shared, and objectives were clarified. Strict confidentiality of patient data was maintained throughout the study.

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REFERENCES

1. Nikolopoulou GB, Maltezou HC. COVID-19 in Children: Where do we Stand? Arch Med Res. 2022 Jan;53[1]:1-8. doi: 10.1016/j.arcmed.2021.07.002.

2. [WHO] WHO. WHO COVID-19 dashboard. 2025. Available at: Last accessed, December 2024, https://data.who.int/dashboards/covid19/cases

3. Cavalcante Pinto Júnior V, Moura LFWG, Cavalcante RC, Lima JRC, Bezerra AS, de Sousa Dantas DR, et al. Prevalence of COVID-19 in children, adolescents and adults in remote education situations in the city of Fortaleza, Brazil. Int J Infect Dis. 2021 Jul; 108:20-26. doi: 10.1016/j.ijid.2021.04.086.

4. Ludvigsson JF. Systematic review of COVID-19 in children shows milder cases and a better prognosis than adults. Acta Paediatr. 2020 Jun;109[6]:1088-1095. doi: 10.1111/apa.15270.

5. Alsharrah D, Alhaddad F, Alyaseen M, Aljamaan S, Almutairi N, Ayed M, Papenburg J, Alghounaim M. Clinical characteristics of pediatric SARS-CoV-2 infection and coronavirus disease 2019 [COVID-19] in Kuwait. J Med Virol. 2021 May;93[5]:3246-3250. doi: 10.1002/jmv.26684.

6. Tagarro A, Epalza C, Santos M, Sanz-Santaeufemia FJ, Otheo E, Moraleda C, Calvo C. Screening and Severity of Coronavirus Disease 2019 [COVID-19] in Children in Madrid, Spain. JAMA Pediatr. 2020: e201346. doi: 10.1001/jamapediatrics.2020.1346.

7. Alsohime F, Temsah MH, Al-Nemri AM, Somily AM, Al-Subaie S. COVID-19 infection prevalence in pediatric population: Etiology, clinical presentation, and outcome. J Infect Public Health. 2020 Dec;13[12]:1791-1796. doi: 10.1016/j.jiph.2020.10.008.

8. AlGhamdi A, Al Talhi Y, Al Najjar A, Sobhi A, Al Juaid A, Ibrahim A, et al. Epidemiology, clinical characteristics and risk factors of COVID-19 among children in Saudi Arabia: a multicenter chart review study. BMC Pediatr. 2022 Feb 12;22[1]:86. doi: 10.1186/ s12887-021-02959-8.

9. Musa OAH, Chivese T, Bansal D, Abdulmajeed J, Ameen O, Islam N, et al. Prevalence and determinants of symptomatic COVID-19 infection among children and adolescents in Qatar: a cross-sectional analysis of 11 445 individuals. Epidemiol Infect. 2021 Sep 14;149: e203. doi: 10.1017/ S095026882100203X.

10. Jackson WM, Price JC, Eisler L, Sun LS, Lee JJ. COVID-19 in Pediatric Patients: A Systematic Review. J Neurosurg Anesthesiol. 2022 Jan 1;34[1]:141-147. doi: 10.1097/ANA.0000000000000803.

11. CDC COVID-19 Response Team. Coronavirus Disease 2019 in Children - United States, February 12-April 2, 2020. MMWR Morb Mortal Wkly Rep. 2020 Apr 10;69[14]:422-426. doi: 10.15585/ mmwr.mm6914e4.

12. Castagnoli R, Votto M, Licari A, Brambilla I, Bruno R, Perlini S, Rovida F, Baldanti F, Marseglia GL. Severe Acute Respiratory Syndrome Coronavirus 2 [SARS-CoV-2] Infection in Children and Adolescents: A Systematic Review. JAMA Pediatr. 2020 Sep 1;174[9]:882-889. doi: 10.1001/jamapediatrics.2020.1467.

13. Duarte-Salles T, Vizcaya D, Pistillo A, Casajust P, Sena AG, Lai LYH, et al. Baseline characteristics, management, and outcomes of 55,270 children and adolescents diagnosed with COVID-19 and 1,952,693 with influenza in France, Germany, Spain, South Korea and the United States: an international network cohort study. medRxiv [Preprint]. 2020 Oct 30:2020.10.29. 20222083. doi: 10.1101/2020.10.29.20222083.

14. Choi JH, Choi SH, Yun KW. Risk Factors for Severe COVID-19 in Children: A Systematic Review and Meta-Analysis. J Korean Med Sci. 2022 Feb 7;37[5]: e35. doi: 10.3346/jkms.2022.37.e35.

15. [CDC] C for DC and P. Multisystem Inflammatory Syndrome [MIS]. Published online 2024. https://www.cdc.gov/mis/about/ index.html

16. Ibrahim NK. Epidemiologic surveillance for controlling Covid-19 pandemic: types, challenges and implications. J Infect Public Health. 2020 Nov;13[11]:1630-1638. doi: 10.1016/j.jiph.2020. 07.019.

17. Dong Y, Mo X, Hu Y, Qi X, Jiang F, Jiang Z, Tong S. Epidemiology of COVID-19 Among Children in China. Pediatrics. 2020 Jun;145[6]: e20200702. doi: 10.1542/peds.2020-0702.

18. Feng Y, Ling Y, Bai T, Xie Y, Huang J, Li J, et al. COVID-19 with Different Severities: A Multicenter Study of Clinical Features. Am J Respir Crit Care Med. 2020 Jun 1;201[11]:1380-1388. doi: 10.1164/rccm.202002-0445OC.

19. Xu Y, Chen Y, Tang X. Guidelines for the diagnosis and treatment of coronavirus disease 2019 [COVID-19] in China. Glob Health Med. 2020 Apr 30;2[2]:66-72. doi: 10.35772/ghm.2020.01015.

20. Götzinger F, Santiago-García B, Noguera-Julián A, Lanaspa M, Lancella L, et al; PTBNET COVID-19 Study Group. COVID-19 in children and adolescents in Europe: a multinational, multicentre cohort study. Lancet Child Adolesc Health. 2020 Sep;4[9]:653-661. doi: 10.1016/S2352-4642[20]30177-2.

21. Kim L. Hospitalization rates and characteristics of children aged 18 years hospitalized with laboratory-confirmed COVID-19—COVID-NET, 14 states, March 1–July 25, 2020. MMWR Morb Mortal Wkly Rep. 2020;69.https://www.cdc.gov/mmwr/volumes/ 69/wr/ pdfs/mm6933a3-H.pdf

22. Cloete J, Kruger A, Masha M. Rapid rise in paediatric COVID-19 hospitalisations during the early stages of the Omicron wave, Tshwane District, South Africa. Medrxiv. Published online 2021:2012-2021.https://doi.org/10.1101/2021.12.08.21267431

23. Zare-Zardini H, Soltaninejad H, Ferdosian F, Hamidieh AA, Memarpoor-Yazdi M. Coronavirus disease 2019 [COVID-19] in children: prevalence, diagnosis, clinical symptoms, and treatment. Int J Gen Med. Published online 2020:477-482.https://doi.org/ 10.2147/IJGM.S285717

24. Dawood FS, Porucznik CA, Veguilla V. Incidence Rates, Household Infection Risk, and Clinical Characteristics of SARS-CoV-2 Infection Among Children and Adults in Utah and New York City, New York. JAMA Pediatr. 2021;176[1]:1–9. https://doi.org/10.1001/jamapediatrics.2021.

25. Sisk B. Children and COVID-19: State Data Report-A joint report from the American Academy of Pediatrics and the Children's Hospital Association. Published online 2020. Available at https://ncrc.jhsph.edu/research/children-and-covid-19-state-data-report/

26. Delahoy MJ. Hospitalizations associated with COVID-19 among children and adolescents—COVID-NET, 14 states, March 1, 2020–August 14, 2021. MMWR Morb Mortal Wkly Rep. 2021;70.

27. Howard-Jones AR, Burgner DP, Crawford NW, Goeman E, Gray PE, Hsu P, Kuek S, McMullan BJ, Tosif S, Wurzel D, Bowen AC, Danchin M, Koirala A, Sharma K, Yeoh DK, Britton PN. COVID-19 in children. II: Pathogenesis, disease spectrum and management. J Paediatr Child Health. 2022;58[1]:46-53. doi: 10.1111/jpc.15811.

28. Ennab F, ElSaban M, Khalaf E, Tabatabaei H, Khamis AH, Devi BR, et al. Clinical Characteristics of Children With COVID-19 in the United Arab Emirates: Cross-sectional Multicenter Study. JMIR Pediatr Parent. 2021 Nov 5;4[4]:e29049. doi: 10.2196/29049.

29. Cui X, Zhao Z, Zhang T, Guo W, Guo W, Zheng J, et al. A systematic review and meta-analysis of children with coronavirus disease 2019 [COVID-19]. J Med Virol. 2021 Feb;93[2]:1057-1069. doi: 10.1002/jmv.26398.

30. Akram NN. Characteristics and Outcome of Hospitalized Children with COVID-19: A Single Center Experience. Indian J Forensic Med Toxicol. 2022;16[1], doi: 10.37506/ijfmt.v16i1.17606

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