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Original Article (Pages: 18995-19007)

# Clinical and Laboratory Findings in Children with Covid-19

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***Abstract***

***Background:*** This study aimed to investigate the clinical characteristics of children diagnosed with COVID-19 in Dr. Masih Daneshvari Hospital from September 2021 to September 2022 to provide insights into the diagnosis and effective management of COVID-19 infection in children.

***Methods:*** In this cross-sectional study, 70 children (under 18 years old) with COVID-19, meeting the study's inclusion criteria, were enrolled after obtaining informed written consent from their parents, and no charges were imposed on them. Demographic information, including age, gender, and family history of COVID-19 exposure, was recorded for the patients. Clinical manifestations and laboratory findings, including Complete Blood Count (CBC), Erythrocyte Sedimentation Rate (ESR), C - C-reactive protein (CRP), and Lactate Dehydrogenase (LDH), were documented according to standard questionnaires. Finally, the study results were analyzed using SPSS software to enhance the diagnosis and follow-up of children with COVID-19.

***Results:*** Among the 70 study participants, 32 were female (45.7%), and 38 were male (54.3%). Regarding age distribution, 14 cases (20%) were less than six years old, 23 cases (32.9%) aged 6-12 years, and 33 cases (47.1%) aged 12-18 years. Among the participants, 66 (94.3%) tested positive for PCR-COVID, while 4 had negative PCR-COVID results. Common clinical findings in the study population included fever, cough, and lethargy.

***Conclusion:*** In symptomatic patients, laboratory findings are mainly present that can help identify individuals who are severely ill. Overall, COVID-19 disease in children has a lower prevalence and severity than that in adults, and the mortality rate is estimated to be very low.

***Key Words:*** CBC, Children with COVID-19, CRP, Cough, ESR, Fever, LDH.

* Please cite this article as: Ghaffaripour H, Hasani Ranjbar S, Hassanzad H, Mirzendedel M, Sadati E. Clinical and Laboratory Findings in Children with Covid-19. J Ped Perspect 2024; 12 (09):18995-19007. DOI: **10.22038/ijp.2024.75151.5371**

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Received date: Sept.25,2023; Accepted date:Nov.21,2024

## 1- INTRODUCTION

The global impact of the COVID-19 pandemic, caused by the Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2), has affected communities worldwide. Pediatricians and healthcare workers are familiar with endemic seasonal coronaviruses that cause mild upper respiratory infections in children (1). In contrast, SARS-CoV-2 has exhibited an extraordinary transmission rate due to its unique virus-host interactions and environmental factors. Due to the lack of initial data on the safety and efficacy and the relatively mild nature of the disease in the pediatric population, COVID-19 vaccination programs for children are being implemented much later than in adults. Children make up a minority of COVID-19 infections globally, though this may be changing, and evidence to date suggests that they are not primary drivers of transmission. Nevertheless, they have borne some of the most indirect effects of the pandemic through disruptions in education and reduced social opportunities (2).

Most children with COVID-19 have mild illness; asymptomatic infection has been reported in 15% to 42% of children (3). However, estimating the prevalence in countries with high and daily COVID-19 case numbers has been limited by diagnostic challenges (4). Children with COVID-19 typically present with one or more nonspecific clinical symptoms, most commonly fever and cough, which are indistinguishable from other viral respiratory infections (3). Nonspecific clinical manifestations are common and may be less recognized and reported in many studies (5). The duration of illness in children increases with age, with a median duration of 6 days in school-aged groups (5). Mild or asymptomatic cases, which constitute the majority of pediatric cases, can be easily managed without hospitalization. Like other respiratory viruses, adequate hydration and supportive care are the primary management priorities in these children.

Previous research has identified various factors contributing to children's susceptibility to COVID-19; Rahimzadeh et al. reported individual cases of 9 children with COVID-19 in March 2020 (6). Among these cases, six were male, and the youngest was two. All children had at least one family member with COVID-19. Common clinical findings included fever, ague, myalgia, cough, tachypnea, wheezing, and crackles. None of the patients presented with diarrhea, vomiting, or rhinorrhea. Three cases had leukopenia and lymphopenia. RNA COVID-19 was identified in three cases. Elevated CRP and ESR were observed in all cases. Two cases had elevated levels of lactate dehydrogenase. All patients received supportive care and antibiotic therapy and were discharged in good general condition within six days. They concluded that COVID-19 pneumonia in children without underlying diseases has a favorable outcome. Patients improved without the need for LPN/r, ribavirin, or mechanical ventilation. This study did not focus on the details and differences in HRCT in children and had a limited sample size, reflecting the limited reports on COVID-19 in children at the time of the study.

In a cross-sectional study by Armin et al. from March 2020 to March 2021, clinical symptoms of 278 children under 18 years old (average age 5.3 years, 59.4% male) were retrospectively examined (7). They demonstrated that 37.8% had underlying diseases, mostly malignancies. The most common symptoms were fever and cough. Abnormal laboratory findings were observed in this group of children.

In 2020, Wei Xia et al. compared and examined the clinical, laboratory, and HRCT characteristics of 20 children with COVID-19 in Wuhan, China (8). They

found that thirteen children (65%) had a history of close contact with family members diagnosed with COVID-19. Fever (60%) and cough (65%) were the most common symptoms. Furthermore, attention should be paid to increased procalcitonin (80%), which is uncommon in adults. Coinfection (40%) was common in children in this study. It appears that demographic, clinical, and laboratory findings are changing in line with changes in the predominant strain of the virus in the community. Therefore, in this research, we aim to answer whether evaluating the demographic, clinical, laboratory characteristics of children with COVID-19 can help determine the diagnostic pattern of the disease in children.The objectives of the research are as follows:

a) Investigating the relationship between demographic characteristics and clinical manifestations in children with COVID-19;

b) Examining the relationship between CBC, ESR, CRP, LDH, Ferritin, D-Dimer, CK-MB, ALT, AST, PT and PTT laboratory characteristics with clinical manifestations in children with COVID-19

## 2- MATERIALS AND METHODS

### 2-1. Design and sampling

This study was cross-sectional, and no interference was made in it. Since information on the prevalence of COVID-19, especially the number of infected children in Iran, is not available, in line with previous studies (6, 7, 9, 10), in the present study, 70 children (under 18 years old) with COVID-19 who met the study criteria were included.

#### 2-1-1. Inclusion and exclusion criteria

The inclusion criteria included a confirmed diagnosis of COVID-19 with laboratory viral nucleic acid testing (RT-PCR) with throat swab samples and a confirmed history of close contact with suspected individuals or SARS-CoV-2 in family members. If the RT-PCR test evaluation was not performed for a patient, they were excluded from the study.

### 2-2. Procedure

Demographic information, including the age and gender of the patients, as well as the family history of exposure to COVID-19, was recorded for the patients. Clinical manifestations and laboratory findings were documented according to a standard questionnaire, including CBC, ESR, CRP, LDH, Ferritin, D-Dimer, CK-MB, ALT, AST, PT, and PTT.

### 2-3. Data analysis

IBM SPSS Statistics v.23 software was used for statistical analyses of the study data. In populations with a normal distribution, One-way ANOVA was used to examine the variability of means, and Chi-Square and k-independent-samples-Test were used to assess the significance level for data without normal distribution. A significance level of less than 0.05 was considered for the p-values.

## 3- RESULTS

### 3-1. Study Population

Among the 70 study participants, 32 were female (45.7%), and 38 were male (54.3%). Regarding age distribution, 14 cases (20%) were less than six years old, 23 cases (32.9%) aged 6-12 years, and 33 cases (47.1%) aged 12-18 years (Fig. 1).

### 3-2. Clinical Manifestations

The most common clinical findings in the studied individuals were fever (41 cases), cough (38 cases), lethargy (13 cases), myalgia (9 cases), dyspnea (9 cases), ague (6 cases), runny nose (3 cases), headache (3 cases), vomiting (3 cases), diarrhea (3 cases), anorexia (3 cases), sore throat (2 cases), abdominal pain (2 cases), poor feeding (2 cases), chest pain (1 case),

unconsciousness (1 case), and tachycardia (1 case).

### 3-3. Hematological Findings

Complete blood count (CBC), erythrocyte sedimentation rate (ESR), and coagulation tests (PT and PTT) were reported to be abnormal in a considerable number of patients (Table 1).

### 3-4. Biological and Biochemical Findings

Among the examined factors, particularly noteworthy were the elevation of the mean percentage of neutrophils (65.04 ± 2.5), exceeding the normal range (40-60%), and an elevated ESR (24.30 ± 4.32), exceeding the normal limit (≤10).

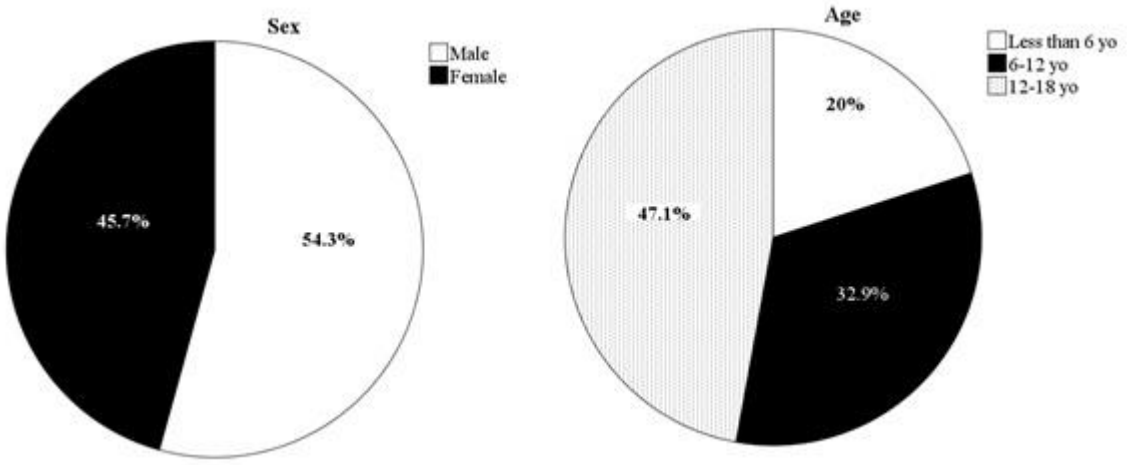


**Fig. 1:** Frequency distribution of age and gender

**Table 1.** Hematological and Biochemical findings

| Parameter | Mean±SD | Normal (n) | Decreased (n) | Increased (n) |
|---|---|---|---|---|
| Hematological | | | | |
| Leukocytes (n=70) | 7218.57 ± 559.32 ($\times 10^9$/L) | 43 | 17 | 10 |
| Neutrophil (n=68) | 64.32 ±2.19 (%) | 43 | 5 | 20 |
| Lymphocyte (n=68) | 28.59 ±1.96 (%) | 46 | 21 | 1 |
| Hb (n=70) | 12.67 ±0.25 (g/dL) | 58 | 12 | 0 |
| Plt (n=67) | 262.40 ±15.96 (×1000) | 55 | 9 | 3 |
| ESR (n=61) | 22.82 ± 3.57 (mm/h) | 38 | 0 | 22 |
| PT (n=54) | 13.12 ± 0.18 (s) | 37 | 0 | 17 |
| INR (n=54) | 1.14 ± 0.02 (SI) | 35 | 0 | 18 |
| PTT (n=53) | 35.08 ±1.05 (s) | 33 | 0 | 20 |
| Biochemical | | | | |
| D-Dimer (n=32) | 798.16 ± 198.80 (mg/L) | 18 | 0 | 14 |
| LDH (n=46) | 494.70 ± 24.80 (U/L) | 25 | 0 | 21 |
| CRP (n=56) | 14.84 ±2.78 (mg/L) | 42 | 0 | 15 |
| Ferritin (n=33) | 191.36 ±29.48 (micg/L) | 27 | 0 | 6 |
| CK-MB (n=23) | 31.57 ±6.28 (IU/L) | 16 | 0 | 7 |
| AST (n=64) | 40.88 ± 3.94 (U/L) | 46 | 0 | 18 |
| ALT (n=64) | 39.17 ± 6.01 (U/L) | 44 | 0 | 20 |
| Troponin (n=14) | 0.025 ± 0.005 (ng/mL) | 14 | 0 | 0 |

- Approximately 24% of these individuals reported leukocytosis and around 14% reported leukopenia.

- Neutrophilia was reported in more than 29% of these patients, while lymphopenia was reported in over 30%.

- Hemoglobin reduction was observed in more than 17% of the patients.

- Elevated ESR was reported in 36.67% of the patients.

- Moreover, an increase in PT and an increase in INR was reported in 31.48% and 33.96% of the patients, respectively.

- Additionally, 37.74% of the study subjects reported an increase in PTT.

The evaluation of biochemical factors, particularly those related to inflammation, included D-Dimer, lactate dehydrogenase (LDH), C-reactive protein (CRP), and ferritin. An increase in these factors was observed in the studied patients (Table 1).

### 3-5. Relationship between demographic characteristics and clinical manifestations in children with COVID-19

A significant inverse correlation was reported between patients' gender and fever and diarrhea (r=-0.248, p=0.039 and r=-0.231, p=0.055, respectively). In addition, a significant direct correlation was reported between patients' age and fever (r=0.342, p=0.004) (Table 2).

### 3-6. Laboratory Findings in Correlation with Clinical Manifestations in Children with COVID-19

The status of leukocytes, hemoglobin level, D-Dimer level, serum CRP level, CRP status, ESR level, and ESR status in patients with fever showed a statistically significant direct correlation (r=0.253, p=0.034; r=310, p=0.009; r=0.364, p=0.041; r=0.357, p=0.006; r=0.345, p=0.009; r=0.249, p=0.053; and r=0.254, p=0.050, respectively).

Sore throat exhibited a significant inverse correlation with AST and ALT status (r=-0.287, p=0.021, and r=-0.266, p=0.033, respectively) in these patients. Cough significantly correlated with neutrophil status (r=0.240, p=0.049).

Dyspnea demonstrated a significant inverse and direct correlation with the percentages of neutrophils and lymphocytes, respectively (r=-0.351, p=0.003, and r=0.231, p=0.058, respectively). The percentage of lymphocytes and lymphocyte status exhibited significant inverse correlations with diarrhea and abdominal pain, respectively (r=-0.263, p=0.030, and r=-0.305, p=0.011, respectively).

In patients, lethargy showed a significant direct correlation with serum ALT level and PT (r=0.290, p=0.020, and r=0.282, p=0.041, respectively). Tremor demonstrated a significant direct correlation with patients' lymphocyte status (r=0.236, p=0.049). Anorexia in patients significantly correlated with the D-Dimer level (r=0.371, p=0.037) (Table 3).

## 4- DISCUSSION

In this study, data from 70 children with COVID-19 were retrospectively examined. The majority of the children were male [32 females (45.7%) and 38 males (54.3%)] and were over 12 years of age. In this regard, Purwati et al. also considered the male gender as a risk factor for COVID-19 due to differences in the immune system between the two genders, with females having lower susceptibility to viral infections (11). Adolescents aged 12-18 were reported to be the largest group requiring hospital services. In line with recent findings, Wang et al., in a large study in collaboration with the CDC at six hospital centers, demonstrated that most cases were related to adolescents aged 12-17 years (12).

**Table 2:** Evaluation of the correlations between demographic characteristics and clinical manifestations

| Parameter | | | Fever | Vomiting | Sore Throat | Cough | Myalgia | Runny Nose | Headache | Dyspnea | Diarrhea | Abdominal Pain | Lethargy | Ague | Anorexia | Poor Feeding | Chest Pain | Unconsciousness |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spearman's rho | Sex | Correlation | -0.248* | 0.053 | -0.015 | -0.094 | -0.162 | 0.053 | -0.089 | 0.095 | -0.231 | -0.187 | -0.078 | -0.129 | 0.053 | -0.131 | -0.131 | 0.110 |
| | | Sig | 0.039 | 0.665 | 0.904 | 0.440 | 0.182 | 0.665 | 0.464 | 0.432 | 0.055 | 0.121 | 0.521 | 0.288 | 0.665 | 0.279 | 0.279 | 0.363 |
| | Age | Correlation | 0.342** | 0.142 | -0.170 | -0.121 | -0.082 | 0.072 | -0.210 | -0.211 | 0.072 | 0.087 | 0.205 | 0.130 | 0.072 | -0.119 | -0.119 | -0.119 |
| | | Sig. | 0.004 | 0.242 | 0.159 | 0.320 | 0.498 | 0.554 | 0.081 | 0.080 | 0.554 | 0.472 | 0.089 | 0.284 | 0.554 | 0.325 | 0.325 | 0.325 |
| | COVID PCR | Correlation | 0.168 | -0.252* | 0.042 | 0.021 | -0.089 | 0.052 | -0.252* | -0.089 | 0.052 | 0.042 | 0.118 | 0.075 | 0.052 | 0.030 | 0.030 | 0.030 |
| | | Sig | 0.165 | 0.035 | 0.729 | 0.862 | 0.462 | 0.668 | 0.035 | 0.462 | 0.668 | 0.729 | 0.332 | 0.535 | 0.668 | 0.808 | 0.808 | 0.808 |
| | Chest CT | Correlation | 0.160 | -0.231 | -0.015 | 0.252* | -0.076 | -0.089 | -0.231 | -0.076 | 0.053 | 0.157 | 0.143 | 0.076 | -0.089 | -0.131 | -0.131 | -0.131 |
| | | Sig. | 0.187 | 0.055 | 0.904 | 0.036 | 0.532 | 0.464 | 0.055 | 0.532 | 0.665 | 0.193 | 0.237 | 0.531 | 0.464 | 0.279 | 0.279 | 0.279 |

**Table 3:** Investigation of the Correlations between Laboratory Findings and Clinical Manifestations

| Parameter | | | Fever | Vomiting | Sore Throat | Cough | Myalgia | Runny Nose | Headache | Dyspnea | Diarrhea | Abdominal Pain | Lethargy | Ague | Anorexia | Poor Feeding | Chest Pain | Unconsciousness |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Spearman's rho | Leu Count | Corr | 0.138 | -0.168 | 0.178 | 0.099 | 0.079 | -0.005 | 0.040 | -0.184 | 0.023 | 0.189 | 0.134 | 0.035 | -0.019 | -0.048 | -0.188 | 0.200 |
| | | Sig. | 0.255 | 0.165 | 0.140 | 0.416 | 0.514 | 0.966 | 0.741 | 0.128 | 0.852 | 0.117 | 0.270 | 0.771 | 0.875 | 0.695 | 0.120 | 0.097 |
| | Leu State | Corr | 0.253* | -0.012 | -0.015 | 0.211 | 0.223 | 0.042 | 0.042 | -0.135 | -0.012 | -0.015 | 0.088 | 0.236* | 0.042 | 0.093 | -0.206 | -0.113 |
| | | Sig. | 0.034 | 0.921 | 0.904 | 0.079 | 0.064 | 0.728 | 0.728 | 0.264 | 0.921 | 0.904 | 0.468 | 0.049 | 0.728 | 0.445 | 0.087 | 0.350 |
| | Neu (%) | Corr | 0.053 | -0.122 | 0.122 | 0.015 | -0.046 | 0.002 | -0.093 | -0.351** | 0.223 | 0.206 | 0.078 | -0.040 | 0.097 | -0.112 | -0.069 | 0.140 |
| | | Sig. | 0.666 | 0.320 | 0.322 | 0.903 | 0.707 | 0.988 | 0.450 | 0.003 | 0.068 | 0.091 | 0.529 | 0.748 | 0.433 | 0.363 | 0.579 | 0.254 |
| | Neu State | Corr | 0.027 | -0.152 | 0.131 | 0.240* | 0.103 | 0.004 | 0.004 | -0.182 | -0.099 | 0.005 | 0.178 | 0.006 | 0.004 | -0.176 | -0.176 | -0.084 |
| | | Sig. | 0.828 | 0.214 | 0.289 | 0.049 | 0.404 | 0.972 | 0.972 | 0.137 | 0.423 | 0.966 | 0.146 | 0.960 | 0.972 | 0.151 | 0.151 | 0.494 |
| | Lym (%) | Corr | -0.040 | 0.212 | -0.089 | -0.104 | 0.044 | 0.097 | 0.089 | 0.231 | -0.263* | -0.111 | -0.035 | 0.032 | -0.078 | 0.103 | 0.078 | -0.153 |
| | | Sig. | 0.748 | 0.083 | 0.472 | 0.398 | 0.720 | 0.433 | 0.468 | 0.058 | 0.030 | 0.368 | 0.774 | 0.797 | 0.525 | 0.404 | 0.528 | 0.214 |
| | Lym | Corr | -0.138 | -0.153 | -0.063 | 0.154 | -0.004 | -0.153 | -0.002 | -0.004 | -0.052 | -0.305* | 0.076 | -0.003 | 0.148 | 0.084 | 0.084 | 0.084 |

| Parameter | | | Fever | Vomiting | Sore Throat | Cough | Myalgia | Runny Nose | Headache | Dyspnea | Diarrhea | Abdominal Pain | Lethargy | Ague | Anorexia | Poor Feeding | Chest Pain | Unconsciousness |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | State | Sig. | 0.263 | 0.214 | 0.611 | 0.210 | 0.974 | 0.214 | 0.986 | 0.974 | 0.676 | 0.011 | 0.537 | 0.979 | 0.228 | 0.495 | 0.495 | 0.495 |
| | Hb (g/dL) | Corr | 0.004 | 0.203 | -0.188 | -0.111 | -0.018 | -0.042 | 0.107 | 0.065 | 0.067 | -0.043 | 0.108 | 0.009 | 0.130 | 0.024 | -0.030 | -0.081 |
| | | Sig. | 0.976 | 0.093 | 0.118 | 0.360 | 0.882 | 0.728 | 0.376 | 0.593 | 0.582 | 0.725 | 0.372 | 0.942 | 0.282 | 0.843 | 0.805 | 0.504 |
| | Hb State | Corr | 0.310** | -0.091 | 0.078 | 0.115 | 0.175 | 0.096 | 0.096 | -0.165 | 0.096 | 0.078 | 0.022 | 0.139 | 0.096 | 0.055 | 0.055 | 0.055 |
| | | Sig. | 0.009 | 0.454 | 0.521 | 0.342 | 0.148 | 0.428 | 0.428 | 0.172 | 0.428 | 0.521 | 0.855 | 0.250 | 0.428 | 0.653 | 0.653 | 0.653 |
| | Plt (X1000) | Corr | 0.111 | -0.069 | 0.206 | -0.032 | 0.194 | -0.114 | 0.127 | -0.137 | -0.147 | -0.066 | 0.002 | 0.151 | 0.101 | -0.197 | -0.159 | 0.194 |
| | | Sig. | 0.373 | 0.579 | 0.094 | 0.799 | 0.117 | 0.359 | 0.306 | 0.269 | 0.234 | 0.597 | 0.987 | 0.221 | 0.417 | 0.109 | 0.198 | 0.115 |
| | Plt State | Corr | 0.070 | 0.101 | 0.082 | 0.190 | 0.183 | 0.101 | 0.101 | 0.054 | 0.101 | 0.082 | -0.070 | 0.016 | 0.101 | 0.057 | 0.057 | -0.248* |
| | | Sig. | 0.573 | 0.417 | 0.511 | 0.123 | 0.138 | 0.417 | 0.417 | 0.662 | 0.417 | 0.511 | 0.572 | 0.896 | 0.417 | 0.645 | 0.645 | 0.043 |
| | D-Dimer | Corr | 0.207 | . | -0.140 | 0.152 | 0.017 | -0.263 | . | -0.146 | -0.049 | 0.282 | -0.033 | -0.084 | 0.371* | . | . | . |
| | | Sig | 0.255 | . | 0.445 | 0.407 | 0.925 | 0.146 | . | 0.426 | 0.792 | 0.118 | 0.859 | 0.648 | 0.037 | . | . | . |
| | D-Dimer State | Corr | 0.364* | . | -0.293 | 0.168 | 0.068 | -0.204 | . | -0.204 | 0.158 | 0.158 | 0.162 | -0.033 | 0.228 | . | . | . |
| | | Sig. | 0.041 | . | 0.104 | 0.357 | 0.713 | 0.264 | . | 0.264 | 0.387 | 0.387 | 0.376 | 0.860 | 0.210 | . | . | . |
| | O2-Sat State | Corr | 0.447 | 0.488 | . | 0.067 | -0.293 | 0.488 | -0.293 | -0.447 | . | . | . | . | . | . | . | . |
| | | Sig. | 0.267 | 0.220 | . | 0.875 | 0.482 | 0.220 | 0.482 | 0.267 | . | . | . | . | . | . | . | . |
| | LDH | Corr | -0.192 | -0.289 | -0.161 | -0.072 | 0.163 | -0.145 | 0.051 | 0.064 | -0.217 | 0.024 | 0.010 | -0.116 | -0.129 | -0.006 | . | -0.241 |
| | | Sig. | 0.202 | 0.051 | 0.286 | 0.634 | 0.280 | 0.338 | 0.739 | 0.673 | 0.148 | 0.874 | 0.948 | 0.442 | 0.392 | 0.970 | . | 0.106 |
| | LDH State | Corr | 0.022 | -0.233 | -0.233 | -0.091 | 0.128 | -0.019 | 0.137 | -0.027 | -0.019 | -0.019 | 0.060 | -0.111 | -0.111 | -0.163 | . | -0.163 |
| | | Sig. | 0.887 | 0.120 | 0.120 | 0.547 | 0.397 | 0.902 | 0.365 | 0.859 | 0.902 | 0.902 | 0.693 | 0.461 | 0.461 | 0.280 | . | 0.280 |
| | CRP | Corr | 0.357** | -0.125 | 0.143 | -0.064 | -0.093 | 0.050 | -0.207 | -0.373** | 0.082 | 0.147 | 0.151 | 0.071 | 0.070 | . | -0.131 | . |
| | | Sig. | 0.006 | 0.354 | 0.289 | 0.635 | 0.490 | 0.709 | 0.122 | 0.004 | 0.546 | 0.275 | 0.262 | 0.597 | 0.606 | . | 0.332 | . |
| | CRP State | Corr | 0.345** | -0.216 | 0.114 | -0.106 | -0.019 | 0.141 | -0.103 | -0.383** | -0.103 | 0.080 | 0.090 | 0.164 | 0.141 | . | -0.224 | . |
| | | Sig. | 0.009 | 0.107 | 0.399 | 0.432 | 0.887 | 0.296 | 0.448 | 0.003 | 0.448 | 0.555 | 0.504 | 0.222 | 0.296 | . | 0.095 | . |
| | ESR | Corr | 0.249 | -0.123 | 0.081 | -0.135 | -0.045 | 0.244 | -0.241 | -0.384** | 0.147 | -0.044 | 0.067 | 0.010 | 0.140 | -0.132 | 0.059 | 0.011 |
| | | Sig. | 0.053 | 0.346 | 0.536 | 0.299 | 0.729 | 0.059 | 0.062 | 0.002 | 0.259 | 0.736 | 0.609 | 0.938 | 0.282 | 0.310 | 0.653 | 0.933 |
| | ESR State | Corr | 0.254 | -0.143 | 0.099 | -0.107 | 0.061 | 0.175 | -0.244 | -0.455** | 0.099 | 0.099 | 0.035 | -0.021 | 0.175 | -0.171 | 0.099 | 0.099 |
| | | Sig. | 0.050 | 0.276 | 0.451 | 0.416 | 0.643 | 0.182 | 0.060 | <0.001 | 0.451 | 0.451 | 0.793 | 0.874 | 0.182 | 0.191 | 0.451 | 0.451 |
| | PT | Corr | 0.124 | 0.052 | 0.073 | 0.074 | 0.115 | -0.125 | 0.139 | -0.241 | 0.139 | 0.139 | 0.165 | 0.133 | 0.245 | -0.093 | -0.143 | 0.139 |
| | | Sig. | 0.371 | 0.710 | 0.601 | 0.593 | 0.407 | 0.367 | 0.317 | 0.080 | 0.317 | 0.317 | 0.233 | 0.336 | 0.074 | 0.506 | 0.301 | 0.317 |
| | PT State | Corr | 0.114 | -0.010 | 0.133 | -0.019 | 0.113 | -0.010 | 0.093 | -0.279* | 0.093 | 0.093 | 0.075 | 0.079 | 0.164 | -0.203 | -0.203 | 0.093 |
| | | Sig. | 0.413 | 0.945 | 0.338 | 0.889 | 0.417 | 0.945 | 0.503 | 0.041 | 0.503 | 0.503 | 0.592 | 0.570 | 0.235 | 0.142 | 0.142 | 0.503 |
| | INR | Corr | 0.141 | 0.099 | 0.070 | 0.028 | 0.058 | 0.003 | 0.131 | -0.281* | 0.131 | 0.131 | 0.243 | 0.037 | 0.232 | -0.141 | -0.174 | 0.131 |
| | | Sig. | 0.308 | 0.475 | 0.613 | 0.840 | 0.675 | 0.984 | 0.344 | 0.039 | 0.344 | 0.344 | 0.076 | 0.790 | 0.092 | 0.310 | 0.210 | 0.344 |

| Parameter | | | Fever | Vomiting | Sore Throat | Cough | Myalgia | Runny Nose | Headache | Dyspnea | Diarrhea | Abdominal Pain | Lethargy | Ague | Anorexia | Poor Feeding | Chest Pain | Unconsciousness |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | INR State | Corr | 0.099 | 0.003 | 0.142 | 0.043 | 0.005 | 0.003 | 0.099 | -0.254 | 0.099 | 0.099 | 0.102 | 0.095 | 0.176 | -0.193 | -0.193 | 0.099 |
| | | Sig. | 0.480 | 0.982 | 0.310 | 0.761 | 0.973 | 0.982 | 0.479 | 0.066 | 0.479 | 0.479 | 0.466 | 0.498 | 0.208 | 0.165 | 0.165 | 0.479 |
| | PTT | Corr | 0.028 | -0.153 | -0.120 | -0.059 | 0.090 | 0.065 | -0.232 | -0.019 | 0.036 | -0.018 | 0.282* | 0.066 | 0.094 | -0.200 | 0.232 | -0.123 |
| | | Sig. | 0.843 | 0.275 | 0.392 | 0.675 | 0.523 | 0.644 | 0.095 | 0.893 | 0.796 | 0.897 | 0.041 | 0.641 | 0.505 | 0.151 | 0.095 | 0.381 |
| | PTT State | Corr | 0.006 | -0.050 | -0.050 | -0.103 | 0.155 | 0.154 | -0.178 | -0.107 | 0.108 | 0.108 | 0.235 | 0.118 | 0.022 | -0.178 | 0.108 | -0.178 |
| | | Sig. | 0.966 | 0.722 | 0.722 | 0.464 | 0.267 | 0.270 | 0.202 | 0.447 | 0.442 | 0.442 | 0.090 | 0.400 | 0.874 | 0.202 | 0.442 | 0.202 |
| | CK-MB | Corr | 0.026 | . | -0.258 | -0.020 | -0.152 | 0.322 | . | -0.070 | . | . | 0.119 | 0.078 | 0.290 | . | . | -0.354 |
| | | Sig. | 0.905 | . | 0.235 | 0.929 | 0.490 | 0.134 | . | 0.751 | . | . | 0.587 | 0.723 | 0.180 | . | . | 0.097 |
| | CK-MB State | Corr | 0.123 | . | -0.322 | 0.123 | -0.131 | 0.141 | . | -0.131 | . | . | 0.349 | -0.024 | 0.141 | . | . | -0.322 |
| | | Sig. | 0.575 | . | 0.134 | 0.575 | 0.551 | 0.521 | . | 0.551 | . | . | 0.103 | 0.912 | 0.521 | . | . | 0.134 |
| | Ferritin | Corr | 0.129 | . | -0.149 | 0.146 | 0.156 | -0.056 | -0.223 | -0.160 | 0.133 | -0.130 | 0.007 | 0.000 | 0.133 | . | . | . |
| | | Sig. | 0.475 | . | 0.409 | 0.419 | 0.386 | 0.758 | 0.213 | 0.373 | 0.461 | 0.471 | 0.967 | 1.000 | 0.459 | . | . | . |
| | Ferritin State | Corr | 0.100 | . | 0.083 | 0.333 | 0.175 | 0.083 | 0.083 | 0.120 | -0.124 | -0.210 | 0.083 | 0.120 | 0.120 | . | . | . |
| | | Sig. | 0.580 | . | 0.645 | 0.058 | 0.330 | 0.645 | 0.645 | 0.507 | 0.491 | 0.242 | 0.645 | 0.507 | 0.507 | . | . | . |
| | AST | Corr | -0.226 | -0.002 | -0.214 | 0.154 | 0.027 | 0.160 | 0.068 | 0.120 | -0.172 | -0.029 | 0.068 | -0.047 | -0.060 | -0.048 | 0.205 | -0.194 |
| | | Sig. | 0.073 | 0.985 | 0.090 | 0.224 | 0.834 | 0.205 | 0.593 | 0.343 | 0.174 | 0.819 | 0.591 | 0.711 | 0.637 | 0.708 | 0.105 | 0.124 |
| | AST State | Corr | -0.164 | 0.112 | -0.287* | 0.099 | -0.047 | 0.112 | 0.139 | 0.053 | -0.190 | -0.087 | 0.057 | -0.077 | -0.026 | 0.079 | 0.079 | -0.201 |
| | | Sig. | 0.196 | 0.377 | 0.021 | 0.437 | 0.713 | 0.377 | 0.274 | 0.677 | 0.132 | 0.492 | 0.656 | 0.546 | 0.840 | 0.536 | 0.536 | 0.111 |
| | ALT | Corr | -0.159 | 0.039 | -0.202 | 0.057 | 0.034 | 0.041 | -0.068 | 0.035 | -0.040 | -0.075 | 0.290* | -0.110 | 0.066 | -0.150 | 0.212 | -0.194 |
| | | Sig. | 0.208 | 0.760 | 0.110 | 0.652 | 0.789 | 0.746 | 0.593 | 0.782 | 0.753 | 0.554 | 0.020 | 0.385 | 0.604 | 0.236 | 0.093 | 0.124 |
| | ALT State | Corr | -0.214 | -0.073 | -0.266* | -0.166 | -0.018 | 0.121 | -0.010 | -0.018 | -0.010 | -0.073 | 0.173 | -0.181 | -0.010 | -0.187 | 0.085 | -0.187 |
| | | Sig. | 0.089 | 0.568 | 0.033 | 0.189 | 0.887 | 0.341 | 0.938 | 0.887 | 0.938 | 0.568 | 0.172 | 0.153 | 0.938 | 0.139 | 0.505 | 0.139 |
| | Troponin | Corr | 0.240 | . | 0.077 | -0.207 | 0.077 | . | . | 0.113 | . | . | -0.439 | 0.077 | . | . | 0.077 | . |
| | | Sig. | 0.408 | . | 0.794 | 0.478 | 0.794 | . | . | 0.700 | . | . | 0.117 | 0.794 | . | . | 0.794 | . |
| | Troponin State | Corr | 0.240 | . | 0.077 | -0.207 | 0.077 | . | . | 0.113 | . | . | -0.439 | 0.077 | . | . | 0.077 | . |
| | | Sig. | 0.408 | . | 0.794 | 0.478 | 0.794 | . | . | 0.700 | . | . | 0.117 | 0.794 | . | . | 0.794 | . |

More than 94% of individuals tested positive for PCR-COVID, a percentage that has varied in different studies. For example, Armin et al., 2022, reported a PCR-positive result in only 63% of the children (13).

Previous studies have shown that the Omicron variant causes milder disease (less need for hospitalization, special care, and mechanical ventilation) in both children and adults compared to the Delta variant (14). The most common clinical findings in the study population were fever (58.6%), cough (54.3%), and lethargy (18.6%). Overall, in the present study, symptoms with lower severity were more prevalent with the Omicron variant. Different data were observed in a study conducted in the UK, where fever and/or respiratory symptoms (86%) were the most common symptoms (15). However, two other reports from China in 2021 showed that fever was a prominent symptom among children infected with the Delta variant, with percentages of 76.2% and 73%, respectively (16). It is worth noting that Jin et al., 2022, in a study on 6,287 children in South Africa reported that fever (61%) and cough (57%) were the most common symptoms among children infected with the Omicron variant (B.1.1.529), which is more consistent with our data. These results indicate that the symptoms caused by the Omicron variant differ from those caused by the Delta variant, and geographical differences also affect the types and prevalence of symptoms.

Eight patients had underlying diseases, including cystic fibrosis (n=3), immunodeficiency (n=2), sarcoma (n=1), and Hodgkin lymphoma (n=1). Three of the studied patients had cystic fibrosis, practically belonging to a clinical population at higher inherent risk for COVID-19. CF is recognized as a comorbid disease, even as a risk factor for severe COVID-19 (17). The rate of COVID-19 infection in CF patients has been reported to be higher than that in the general population (of similar ages), and these individuals have significantly higher rates of hospitalization and need for intensive care (18). In addition to CF, one of the most critical risk factors for COVID-19, especially severe forms of the disease, is the presence of immunodeficiency in individuals. Various types of immunodeficiencies, both congenital (genetic) and acquired with multiple causes such as HIV infection, organ transplantation, and chemotherapy, increase the risk of COVID-19 (19). The present study reported 2 cases of children with congenital immunodeficiency and 2 cases with reduced immunity due to chemotherapy (1 sarcoma and 1 Hodgkin lymphoma). For most COVID-19 patients with immunodeficiency, using antiviral drugs and immunomodulators in doses and durations similar to the general population is recommended. In these individuals, preventive measures and adherence to hygiene guidelines and vaccination are also crucial.

However, in the present study, Complete Blood Cell (CBC) count findings showed leukocytosis, neutrophilia, and an elevated Erythrocyte Sedimentation Rate (ESR). Furthermore, the evaluation of biochemical factors, especially those related to inflammation, including D-Dimer, Lactate Dehydrogenase (LDH), C-Reactive Protein (CRP), and ferritin, indicated an increase in these factors in the studied patients. Additionally, a significant positive correlation was reported between the age of the patients and fever (r=0.342, p=0.004). Moreover, correlations were found between the status of leukocytes, hemoglobin, D-Dimer, serum CRP level, CRP status, ESR level, and ESR status in fevered patients (r=0.253, p=0.034; r=310, p=0.009; r=0.364, p=0.041; r=0.357, p=0.006; r=0.345, p=0.009; r=0.249, p=0.053; and r=0.254, p=0.050,

respectively). Additionally, a direct significant correlation was observed between shivering and lymphocyte status (r=0.236, p=0.049) in patients.These findings suggest that a similar immunological response to that in adults has occurred in the pediatric population, which does not align with the theory of an immature immune system.

An increase in PT and, consequently, in INR were reported in 31.48% and 33.96% of the patients, respectively. Furthermore, an increase in PTT was reported in 37.74% of the studied patients. A previous study by Najafinejad et al. associated this increase in PT and PTT with the severity of the patient's condition, an increased need for ICU admission, and mortality (20). Previous studies on both children and adults confirmed the relationship between increased coagulation test times and the severity of the disease (21), indicating that liver dysfunction can be used as a marker to predict the severity of COVID-19 in children. In this regard, the present study observed an increase in AST and ALT levels in patients. Similarly, in the study by Najafinejad et al., this increase in liver enzyme levels was also observed (20).

Dyspnea showed a significant inverse and direct correlation with the percentages of neutrophils and lymphocytes, respectively (r=-0.351, p=0.003 and r=0.231, p=0.058). This finding is quite unusual and contrary to other studies that have associated the severity of COVID-19 in patients with an increase in the absolute neutrophil count (22). In a recent study, Boribong et al. profiled the blood neutrophils of 152 children with COVID-19 (23). They showed that the neutrophils in children with COVID-19 are stimulated to produce interferon-gamma (IFN-γ)-related gene responses. The present study's findings can also be justified by the fact that in most children, their immune system can manage SARS-CoV-2 due to a strong antiviral response mediated by IFN (24).

An interesting finding is that the percentage of lymphocytes and the status of lymphocytes showed a significant inverse correlation with diarrhea and abdominal pain (r=-0.263, p=0.030 and r=-0.305, p=0.011), respectively. In line with this, a retrospective study by Chen et al. found that the number of lymphocytes in COVID-19 patients with GI symptoms was significantly lower than that in patients without GI symptoms, with lymphopenia being reported explicitly in 122 (34%) patients with gastrointestinal symptoms (25). These findings support the prominent role of lymphopenia in conjunction with increased inflammatory markers (CRP, ESR, etc.) following cytokine storms in the pathogenesis of the disease, which also affects children similarly to adults.

Fever, cough, and lethargy were the most common clinical findings in the study population. These findings are consistent with the results of systematic review studies, which described the most common symptoms in children as fever (51.6%) and cough (47.3%) (26). It has also been reported that in 94% of 2,143 Chinese children with PCR-confirmed or suspected COVID-19, 4% were asymptomatic, 51% had mild symptoms, and 39% had moderate symptoms (27). Additionally, the present study reported a significant direct correlation between the age of those affected and fever (r=0.342, p=0.004).

## 5- CONCLUSION

In symptomatic patients, laboratory findings are mainly present that can help identify individuals who are severely ill. Given that fever, cough, malaise were the most common clinical findings in the study and laboratory parameters such as increased neutrophil and lymphocyte count, PT, PTT, INR, and inflammatory factors correlate with disease severity, they can be the key to timely diagnosis and treatment and isolating patients. Also, the correlation between gastrointestinal

symptoms and lymphocyte status can help diagnose patients. Overall, the disease caused by SARS-CoV-2 occurs in children with lower prevalence and severity compared to adults, and the mortality rate is estimated to be very low. However, growing evidence suggests that children are as susceptible to infection as adults. This may be due to the fact that children are less exposed to the primary sources of transmission, especially hospitals, and exhibit milder symptoms, so they may be less likely to be tested. Larger epidemiological and clinical cohort studies are needed to better understand the potential consequences of COVID-19 infection in children.

## 6- FUNDING

None.

## 7- CONFLICT OF INTEREST

The authors declare that they have no conflict of interest.

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