



Abdominal Pain in Children with COVID-19

COVID-19'lu Çocuklarda Karın Ağrısı

İD Fatma Özcan Sıkı¹, **İD** Gülsüm Alkan², **İD** Ayşenur Öztürk³, **İD** İlker Enes Taşçı³,
İD Beyza Nur Yaylacı³, **İD** Uendi Osmani³, **İD** Esmâ Sena Çiftçi³, **İD** Rana Rüveyda Keskin³,
İD Ali Osman Cura³, **İD** Ahmet Faruk Aytaç³, **İD** Melih Can Yiğit³, **İD** Muhammed Ali Kale³,
İD Aslı Başar³

¹Selcuk University School of Medicine Department of Pediatric Surgery, Konya, Turkey

²Selcuk University School of Medicine Department of Pediatric Infectious Diseases, Konya, Turkey

³Selcuk University School of Medicine, Semester Students, Konya, Turkey

ABSTRACT

Aim: Severe acute respiratory syndrome coronavirus 2 (SARS CoV 2), which emerged in 2019 and caused a pandemic, was also seen in children with various symptoms. In this study, we examined the systemic signs and symptoms of SARS CoV 2 in pediatric patients and the frequency of surgical abdomen in pediatric patients presenting with abdominal pain.

Material and Method: The records of the patient with a positive COVID-19 test, who applied to the Pediatric Emergency Covid Outpatient Clinic in our institution between January 2020 and December 2022, were retrospectively reviewed. Systemic signs and symptoms were evaluated and the rates of patients with abdominal pain and surgical abdomen were determined.

Results: The records of 783 patients over two years were retrospectively reviewed. The most common complaints were fever (79%), followed by cough (41%), vomiting (26%), gastroenteritis (23%), sore throat (18%), abdominal pain (15%), nausea (12%), dyspnea (11%), neurological findings (10.3%), and MIS-C (multisystem inflammatory syndrome in children) findings (5%) were observed.

Conclusion: The fact that COVID-19 causes abdominal pain in children may delay the diagnosis of the diseases required with possible surgical treatment and increase mortality and morbidity. Therefore, while evaluating systemic effects, these patients should be kept under observation to distinguish between surgical abdomen and the necessary tests for differential diagnosis should be completed together with intermittent physical examination.

Keywords: Abdominal pain, appendicitis, COVID-19, children, MIS-C syndrome

ÖZ

Amaç: 2019 yılında ortaya çıkan ve pandemiye neden olan Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) , çocuklarda da çeşitli semptomlarla kendisini göstermişti. Bu çalışmada SARS-CoV-2 nin çocuk hastalarda sistemik belirti ve bulgularını ve karın ağrısı şikayeti ile gelen çocuk hastaların cerrahi karın olma sıklığını inceledik.

Gereç ve Yöntem: Kurumumuzda Çocuk Acil Covid Polikliniği'ne Ocak-2020- Aralık 2022 tarihleri arasında başvuran covid -19 testis pozitif olan hastanın kayıtları geriye yönelik incelendi. Sistemik belirti ve bulgular değerlendirilip, karın ağrısı olan ve cerrahi karın tanısı alan hastaların oranları belirlendi.

Bulgular: iki yılda 783 hastanın kayıtları geriye yönelik incelendi. En sık ateş (%79) şikayeti mevcuttu ve bunu sırasıyla , öksürük (%41), kusma (%26), gastroenterit (%23), boğaz ağrısı (%18) , karın ağrısı (%15) , bulantı (%12), nefes darlığı (%11), nörolojik bulgular (%10,3), MIS-C (multisystem inflammatory syndrome in children) bulguları (%5) görüldü.

Sonuc: COVID-19 unÇocuklarda karın ağrısına sebep olması olası cerrahi tedavi ile düzelebilecek hastalıkların tanısının gecikmesine ve mortaliteyi arttırmasına neden olabilir. Bu nedenle sistemik etkiler değerlendirilirken cerrahi karın ayırımı yapabilmek için şüpheli hastalar gözlem altında tutulmalı aralıklı yapılan fizik muayene ile birlikte ayrıncı tanı için gerekli tetkikler tamamlanmalıdır.

Anahtar Kelimeler: Apandisit, COVID-19, çocuk, MIS-C sendromu, karın ağrısı

Corresponding Author: Fatma ÖZCAN SIKI

Address: Selcuk University School of Medicine Department of Pediatric Surgery, Konya, Turkey

E-mail: doktorozcan@hotmail.com

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INTRODUCTION

Coronavirus, which has affected the whole world by causing a pandemic, is a linear, non-segmented, single-stranded, positive polarity RNA virus.

This virus primarily developed ARDS associated with high mortality, affecting the respiratory system and causing millions of losses due to other systemic effects. Without the respiratory system being affected, it was observed that the digestive, excretory, cardiovascular, neurological, and immune systems were also affected and progressed with different symptoms depending on these, and it was not always fatal.

In this study, we examined the systemic signs and symptoms of pediatric patients diagnosed with COVID-19 in our institution between the years 2020-2022, and the frequency of surgical abdomen in pediatric patients presenting with abdominal pain.

MATERIAL AND METHOD

The study was approved by the Institutional Selçuk University Local Ethics Committee (2022-97). All procedures were carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki.

The records of patients who applied to the Pediatric Emergency Covid Outpatient Clinic in our institution between January 2020 and December 2022 with a positive Covid-19 test were reviewed retrospectively. The demographic data of the patients, their complaints, clinical characteristics, and blood and imaging test results were recorded. The rates of systemic signs and symptoms were determined, and the rates of patients with abdominal pain and diagnosed with surgical abdomen were determined.

RESULTS

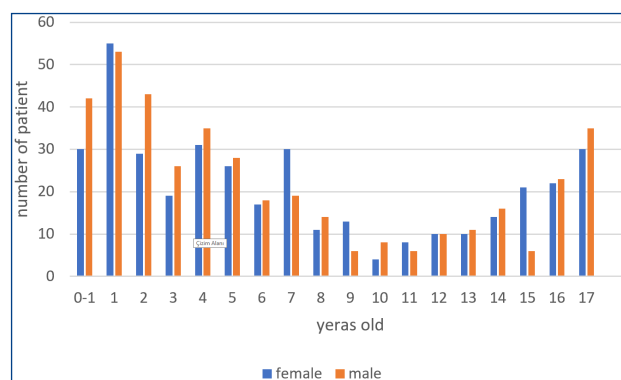
The records of 783 patients who applied to the Pediatric Emergency Covid Outpatient Clinic in our institution between January 2020 and December 2022 were reviewed. The mean age was 7.5 (± 4.8) years. Under the age of 1, there were 72 patients with a mean age of 6.5 (± 6) months. Of the patients who applied, 404 (52%) were male and 379 (48%) were female. The age distribution of the patients by gender is given in detail in **Graph 1**.

617 (79%) of the patients had fever; 318 (41%) had cough; vomiting in 203 (26%); gastroenteritis in 184 (23%); 139 (18%) had sore throat; 117 (15%) had abdominal pain; nausea in 97 (12%); 87 (11%) had shortness of breath; Neurological findings in 81 (10.3%); 47 (6%) had asthma; In 37 (5%) MIS-C

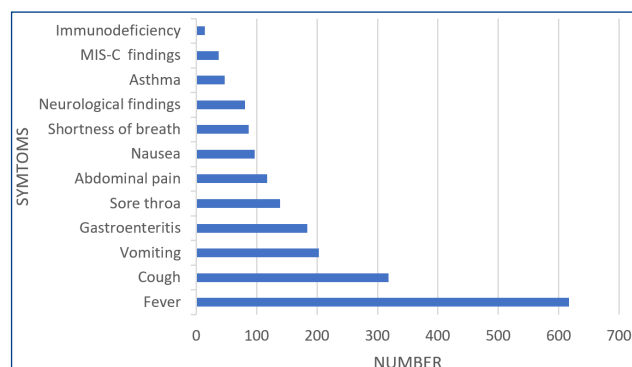
(multisystem inflammatory syndrome in children) findings; It was observed that 14 (2%) had a history of immunodeficiency. The presentation findings of the patients are given in detail in **Graph 2**.

The mean age of 117 patients who presented with the complaint of abdominal pain was 10.8 ± 5.3 . 77 patients were male and 40 patients were female. There was no abdominal tenderness or defense in 88 of the patients, so further imaging examination was not performed. In 18 of the remaining 29 patients, the defense was common, and while the appendix diameter was normal in the abdominal ultrasonography, there was free fluid in the abdomen. These patients were considered to be MIS-C, and they were evaluated together with other system findings and were followed up. In 9 patients, an increase in the thickness of the appendix wall was observed with free fluid in the ultrasonography.

Physical examinations were also compatible with appendicitis. Appendectomy with laparotomy was performed in 6 of these patients; Appendectomy with laparoscopy was performed in 3 of them. While 5 of the patients had acute appendicitis, 4 of them had perforated appendicitis. The mean hospital stay was 5.2 ± 3.4 days. In 2 patients, ovarian torsion was observed by ultrasonography, and ovarian detorsion was performed laparoscopically.



Graph 1: Number of Boys and Girls aged 0-17 who applied to Pediatric Emergency Covid-19 Outpatient Clinic



Graph 2: Admission Findings of 783 Pediatric Patients Applying to the Pediatric Emergency Covid-19 Outpatient Clinic



DISCUSSION

Severe acute respiratory syndrome coronavirus 2 (SARS CoV 2) has made up the majority of studies in recent years in all countries due to the pandemic it caused in 2019. With its emergence in 2019, it began to be referred to as coronavirus disease -2019 (COVID-19).

The virus caused more deaths in adults by causing primary disease and worsening existing chronic diseases. In children, on the other hand, the clinical course was milder, with sad consequences in the case of severe immunological deficiency or cardiac disease. In our study, it was observed that the most common symptom in pediatric patients with positive COVID-19 tests was fever (79%), followed by cough, sore throat, GIS symptoms, abdominal pain, and shortness of breath. While most of the symptoms were at the same time, fever was mostly seen alone or together with upper respiratory tract findings.

The clinical forms of COVID-19 range from mild upper respiratory tract infection to severe respiratory failure and even death. The virus protein binds to ACE-2 (angiotensin-converting enzyme 2) and TMPRSS2 (transmembrane serine protease 2), inhibiting ACE-2 receptors and potentiating the effects of ACE-1 enzyme in plasma. The resulting Ang-2; Since it has proinflammatory, profibrotic, and proapoptotic effects, it explains the mechanism of the known findings of COVID-19. It proves that the systems and organs where ACE-2 receptors are located are under threat.(1)

Fever is the most important finding in MIS-C. The presence of persistent and long-lasting fever is different from many diseases. In our series, 617 patients presented with fever. In addition to the presence of fever, there may be gastrointestinal symptoms including vomiting, abdominal pain and/or diarrhea, mucocutaneous symptoms reminiscent of Kawasaki including conjunctivitis and rash, and findings such as headache, irritability, and encephalopathy, which may include neurological symptoms(1). A similar clinical picture has been identified between MIS-C syndrome and Kawasaki disease. Without early detection and proper management and treatment, MIS-C can lead to serious problems with vital organs such as the heart, lungs, or kidneys. It can impair heart functions by creating problems in the coronary vessels that provide circulation to the heart. In rare cases, MIS-C can cause permanent damage or even death(2-4). In our study, 37 patients presented with MIS-C syndrome findings (5%).

SARS-COV-2 emerges as a virus with neurotropic and neuroinvasion potential. It can pass into the cerebral circulation via the blood-brain barrier and CSF by

hematogenous route or directly pass to the nervous system through the olfactory bulb(5). In our study, neurological findings were detected in 81 patients (10%). Contrary to adult patients, no permanent damage was observed after treatment.

COVID-19 infection, especially in adult patients, directly or indirectly affects the cardiovascular system, causing life-threatening cardiac pathologies to be added to the picture (6). In our series, cardiovascular system involvement was seen only in cases suggestive of MIS-C.

The effects of COVID-19 in the infant age group were generally milder. It has been stated that COVID-19 in infants usually presents as a mild gastrointestinal or respiratory tract infection, but oxygen therapy is required in pneumonia associated with decreases in oxygen saturation. Gastrointestinal symptoms are common in infants infected with SARS-CoV-2, and appetite disturbances in infants have been reported to require hospitalization(7). There were 72 patients in the infant age group in our series, and they were treated for mild gastrointestinal symptoms or oxygen-assisted pneumonia, as stated in the literature.

Abdominal pain usually accompanies other gastrointestinal system findings in COVID-19. Its causes may include gastroenteritis with active infection, mesenteric lymphadenitis, or other systemic effects in MIS-C. It may be accompanied by laboratory disorders. Since the surgical abdominal findings are similar, the diagnosis of diseases that may require surgery became difficult in this period. It has been observed that abdominal pain caused by COVID-19 generally regressed with treatment(2, 8-10). There are studies indicating that the patient presenting with abdominal pain can be differentiated from the surgical abdomen with the help of fever and inflammatory markers accompanied by the duration of the pain(11). In our study, 97 patients were evaluated with the complaint of abdominal pain and only 11 patients had surgical abdomen. 9 appendicitis and 2 ovarian torsions were diagnosed successfully and the patients were treated without losing time after admission.

Although COVID-19 progressed very rapidly in adult patients and resulted in many deaths with systemic effects, it had a milder course in pediatric patients. This may be due to fewer chronic diseases in children (9, 12). In our series, no patient died due to the primary effect of COVID-19.

CONCLUSION

COVID-19 has also shown many of the clinical reflections it causes in adult patients in the pediatric age group. Abdominal pain in children may cause delay in the

diagnosis of diseases that may require surgical treatment and increase mortality and morbidity. Therefore, while evaluating systemic effects, these patients should be kept under observation in order to distinguish between surgical abdomen and the necessary tests for differential diagnosis should be completed together with intermittent physical examination.

ETHICAL DECLARATIONS

Ethics Committee Approval: The study was approved by the Institutional Selçuk University Local Ethics Committee (2022-97).

Informed Consent: Because the study was designed retrospectively, no written informed consent form was obtained from patients.

Referee Evaluation Process: Externally peer-reviewed.

Conflict of Interest Statement: The authors have no conflicts of interest to declare.

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REFERENCES

1. Carlin RF, Fischer AM, Pitkowsky Z, et al. Discriminating Multisystem Inflammatory Syndrome in Children Requiring Treatment from Common Febrile Conditions in Outpatient Settings. *J. of Ped.* 2021;229:26-32.e2.
2. Zhou F, Yu T, Du R, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet (London, England)*. 2020;395(10229):1054-62.
3. Du H, Dong X, Zhang JJ, et al. Clinical characteristics of 182 pediatric COVID-19 patients with different severities and allergic status. *Allergy*. 2021;76(2):510-32.
4. Venn AMR, Schmidt JM, Mullan PC. Pediatric croup with COVID-19. *The A.J.E.M.*. 2021;43:287.e1-e3.
5. Costello F, Dalakas MC. Cranial neuropathies and COVID-19: Neurotropism and autoimmunity. *Neurology*. 2020;95(5):195-6.
6. Patel NA. Pediatric COVID-19: Systematic review of the literature. *A.J.O.L.* . 2020;41(5):102573.
7. Sobolewska-Pilarczyk M, Pokorska-Śpiewak M, Stachowiak A, et al. COVID-19 infections in infants. *Scient. reports*. 2022;12(1):7765.
8. Qi K, Zeng W, Ye M, et al. Clinical, laboratory, and imaging features of pediatric COVID-19: A systematic review and meta-analysis. *Medicine*. 2021;100(15):e25230.
9. Newman S, Simpson J, Perritt A, et al. COVID-19 Result Follow-Up Process in the Pediatric Emergency Department Setting. *D.M.P.H.P.* 2022;16(3):1167-71.
10. Haithem HA, Sadik HK, Hayder AJ. Abdominal pain in children with COVID-19. *Khirurgiia*. 2022(10):58-62.
11. Azılı MN, Güney D, Öztörün CI, et al. Determination of Factors to Distinguish MIS-C from Acute Appendicitis in Children with Acute Abdominal Pain. *Eur j pediatr surg Zeitschrift fur Kinderchirurgie*. 2022;32(3):240-50.
12. Esposito S, Abate L, Laudisio SR, et al. COVID-19 in Children: Update on Diagnosis and Management. *S.R.C.C.M.* 2021;42(6):737-46.