

## ORIGINAL ARTICLE

# The Effect of COVID-19 Pandemic on Acute Appendicitis and Negative Laparotomy

## Pandemi Sırasında Çocuklarda Negatif Laparotomi Oranlarının Değerlendirilmesi

<sup>1</sup>Ayşe Betül Öztürk , <sup>2</sup>Cengizhan Kılıçaslan , <sup>3</sup>Sibel Çiğdem Öztürk , <sup>4</sup>Melike Ordu 

<sup>1</sup>Department of Pediatric Surgery, Aksaray University Training and Research Hospital, Aksaray, Türkiye

<sup>2</sup>Department of Pediatrics, Aksaray University Training and Research Hospital, Aksaray, Türkiye

<sup>3</sup>Department of Biochemistry, Aksaray University Training and Research Hospital, Aksaray, Türkiye

<sup>4</sup>Department of Pathology, Aksaray University Training and Research Hospital, Aksaray, Türkiye

### Correspondence

Cengizhan Kılıçaslan, Department of Pediatrics, Aksaray University, Aksaray, Türkiye

E-Mail: [dr\\_cengizhan@hotmail.com](mailto:dr_cengizhan@hotmail.com)

### How to cite ?

Öztürk A. B. , Kılıçaslan C. , Tuncer S. Ç. , Ordu M. The effect of COVID-19 pandemic on acute appendicitis and negative laparotomy. Genel Tıp Dergisi. 2023; 33(3):292-294.

### ABSTRACT

**Objective:** Emergency service referrals frequently depend on non-urgent problems which are easy to solve without emergency services. Emergency services should be used effectively to raise service quality patient satisfaction and personnel satisfaction. Approximately %30 of emergency service referrals are pediatric patients. The covid-19 pandemic affecting the whole world, caused a decrease in non-covid patient emergency service referral numbers consequently medically non-emergent patient numbers decreased too. Although the number of patients with a prediagnosis of acute appendicitis did not decrease during the pandemic, negative laparotomy rates decreased due to the effective use of emergency services.

**Material and Method:** In this study, we compared patients with a prediagnosis of acute appendicitis and undergone appendectomy in our pediatric emergency service between March 1-September 1, 2019 and March1-September 1,2020. Patient records were evaluated retrospectively. Histopathological diagnoses were accepted as the gold standard.

**Result:** Decreasing referrals of medically non-emergent patients to emergency services during the pandemic led to improvement in service quality, so negative laparotomy rates declined. Looking at the literature, negative laparotomy rates of pediatric patients with the pre-diagnosis of acute appendicitis are 8-30%. In 6 months in 2019, negative laparotomy rate of our clinic was found as 11.2%. When we examine the 6-month data of 2020 during the pandemic, we noticed that this rate declined to 2.8%. There was also a statistically significant difference between 2019 and 2020 in terms of the length of stay in hospital.

**Discussion:** Because of the decrease in the referral numbers of medically non-emergent patients to emergency services during the pandemic, much more qualified and scientific service was provided. Community education considering emergency service referral indications could reduce workload density and enhance the service quality of emergency services.

**Key Words:** Emergency Health Services, Child, Negative Laparotomy, Qualified Health Care, Covid-19 Pandemic

### ÖZ

**Amaç:** Acil servis hizmetlerinin genellikle tıbben acil olmayan, acile başvurmadan kolaylıkla çözümlenebilecek problemlere bağlı olduğu görülmektedir. Hizmet kalitesi, hasta memnuniyeti ve çalışan memnuniyetini artırabilmek için acil servislerin etkin kullanılması gerekmektedir. Acil servis başvurularının yaklaşık %30'unu çocuk acil servisi karşılamaktadır. Tüm dünyayı etkisi altına alan Covid-19 pandemisi nedeniyle acil servislere başvuru sayısı azalmış ve tıbbi anlamda acil olmayan hasta sayıları oldukça düşmüştür. Pandemi sürecinde apandisit ön tanısı ile çocuk acil servisinde değerlendirilen hasta sayılarında anlamlı bir azalma olmamasına rağmen acil servisin etkin kullanımı sağlanabildiği için negatif laparotomi oranları azalmıştır.

**Gereç ve Yöntem:** Bu çalışmada 1 Mart 2019 – 1 Eylül 2019 tarihleri ile 1 Mart 2020-1 Eylül 2020 tarihleri arasında apandisit ön tanısı ile çocuk acilde değerlendirildikten sonra apandektomi yapılan olgular karşılaştırılmıştır. Retrospektif olarak dosyalar incelenmiş ve histopatolojik inceleme sonuçları altın standart olarak kabul edilmiştir.

**Sonuç:** Tıbbi aciliyeti olmayan hastaların pandemi sürecinde acil servislere başvurmaması sonucu acil servislerde hizmet kalitesi artmış, bunun sonucu olarak da negatif laparotomi oranları azalmıştır. Literatür incelendiği zaman apandisit ön tanısı ile opere edilen çocuklarda negatif laparotomi oranı %8-30 olarak karşımıza çıkmaktadır. 2019 yılındaki 6 aylık süreçte bizim kliniğimizde negatif laparotomi oranı %11,2 bulunmuştur. 2020 yılında pandemi sürecindeki 6 aylık veriler incelendiğinde bu oranın %2,8'e gerilediği görülmektedir.

**Tartışma:** Covid-19 pandemisi sürecinde acil servise, tıbbi aciliyeti olmayan hastaların başvuru sayısı azaldığı için daha kaliteli ve bilimsel hizmet sunulabilmiştir. Acil servislere hangi durumlarda başvurulması gerektiği konusunda iyi bir eğitim verilirse acil servislerin yükü azalacaktır ve daha kaliteli hizmet sunulabilecektir.

**Anahtar Kelimeler:** Acil Sağlık Hizmetleri, Çocuk, Negatif Laparotomi, Kaliteli Sağlık Hizmeti, Covid-19 Pandemisi

### Introduction

Emergency services are 24/7 health care providing units. Both patient's doctors and paramedics feel intense anxiety. Suddenly appearing, vital and/or life quality ruining, and incomprehensible events are defined as emergent. Patients and relatives apply to

emergency services to be examined quickly or out of working hours and this situation leads to overcrowding in emergency services (1,2).

Overcrowded patients in emergency departments causes disruptions in health services (3). Examination

periods allocated to patients are shortened, patients' relatives are worried about waiting, healthcare workers are worried that they cannot rest and do their duties effectively, and diagnosis and treatment of true medical emergencies are delayed. As a result, the satisfaction of both patients and their relatives and healthcare professionals decreases and the service quality collapses (4).

The most common disease requiring emergency surgical intervention in children is acute appendicitis. Laboratory findings and imaging methods are helpful for the diagnosis of acute appendicitis, but the main subject is to perform an effective physical examination and take adequate history. Negative laparotomy incidence of acute appendicitis surgery in children is %8-30 (5). Perforation risk increases in patients who cannot be diagnosed definitively and are not followed up for this reason (6-8).

During the pandemic which influences all over the world, emergency service referrals except for actual medical emergencies declined, so effective medical services could be provided. We aimed to emphasize the importance of effective use of emergency services by comparing the negative laparotomy rates and perforation rates of children admitted to our pediatric emergency service and underwent surgery with the diagnoses of acute appendicitis within the pandemic period and the patients before the pandemic.

## Material and Method

This retrospective study was conducted in a regional academic hospital in XXX, Türkiye, that provides tertiary healthcare services. The study was conducted in compliance with the principles of the Declaration of Helsinki and approved by XXX University School of Medicine, XXX Education Research Hospital Scientific Research Evaluation Committee.

## Study Design, Settings, and Patient Selection

The medical records of patients who were admitted to the pediatric emergency department and operated on with a prediagnosis of acute appendicitis between March 1, 2019 - September 1, 2019 and March 1, 2020 - September 1, 2020, were retrospectively analyzed. Patients younger than 18 years old were set as the study group.

Patients' age, gender, histopathological diagnosis, and hospital stays were recorded. Patients' histopathological diagnoses were divided into four groups: acute appendicitis, perforated appendicitis, phlegmonous appendicitis, and negative laparotomy (normal histopathological findings).

## Statistical Analysis

Data were analyzed using SPSS version 22.0 (SPSS Inc, Chicago, IL, USA). Visual (histogram and probability graphs) and analytical methods (Kolmogorov-Smirnov or Shapiro-Wilk tests) were used to determine distribution normality. Descriptive statistics were expressed as mean  $\pm$  standard deviation for normally distributed variables and as median (minimum-

maximum) for those lacking normal distribution. Categorical data were expressed as n (%).

Comparison of 2019 and 2020 data were evaluated using chi-square or Fischer's exact test for categorical variables (gender and histopathological diagnoses), independent-samples t-test for age, and Mann-Whitney's U test for hospital stays. P-value <0.05 was considered statistically significant.

## Results

A total of 161 patients (89 from 2019 and 72 from 2020) were included in the study. The mean age was  $12.42 \pm 3.4$  years. 56.5% (n = 91) of patients were male and 43.5% (n = 70) were female.

The diagnosis of acute appendicitis rate was 56.2% (n = 50) in 2019, while 86.1% (n = 62) in 2020 (P < 0.001). The negative laparotomy rate was 11.2% (n = 10) in 2019 and decreased to 2.8% (n = 2) in 2020 (P < 0.05). There was a statistically significant difference between 2019 and 2020 in terms of the length of hospitalization (P < 0.05). The comparison between 2019 and 2020 is summarized in Table 1.

**Table 1.** The comparison between 2019 and 2020

	2019 (n = 89)	2020 (n = 72)	Pvalue
Age, years, mean $\pm$ SD	13.25 $\pm$ 3.5	11.39 $\pm$ 3.1	0.001*
Male gender, n (%)	55 (61.8)	46 (63.9)	0.785
Acute appendicitis, n (%)	50 (56.2)	62 (86.1)	0.000**
Perforated appendicitis, n (%)	14 (15.7)	4 (5.6)	0.042*
Phlegmonous appendicitis, n (%)	15 (16.9)	4 (5.6)	0.027*
Negative laparotomy, n (%)	10 (11.2)	2 (2.8)	0.042*
Length of stay in hospital, days, median (min-max)	2 (1-6)	2 (1-5)	0.022*

\*P < 0.05, \*\*P < 0.001

## Discussion

During the pandemic, most of the patients did not apply to our emergency service for medically non-emergent situations. The number of emergency service admissions decreased because of patients' and relatives' covid-19 infection concerns and the public was told by government authorities that they should not go to hospitals in really non-emergency situations. Actually, it is a fact to mention that the inappropriate use of emergency services decreased.

Admissions not requiring emergency service experience, sources, and urgent intervention are defined as "inappropriate" admissions (9). Doobinin et al. noticed that %62.8 of emergency service admissions are due to the convenience of reaching health care services (10). Boran et al. reported respiratory tract infections as 55.7 % of all pediatric emergency service admissions (11).

Kinnear et al reported 6.6% (3-14%) negative appendectomies which is in line with our study (12). In our study, the rate of negative laparotomy decreased

from 11.2% to 2.8% with the pandemic.

Orthopoulos et al investigated the effect of COVID-19 pandemic period on complicated appendicitis, and reported that the number of patients decreased during the pandemic period, while increased in complicated appendicitis (13). In contrast to this study, there is a statistically significant decrease in complicated appendicitis in our study.

Decreasing inappropriate emergency service appeals resulted in fast and more effective treatments for true medically emergent patients. Although emergency service appeals decreased, the number of cases indicated surgical intervention due to acute appendicitis did not fall significantly. The rate of patients diagnosed in the non-complicated phase increased. There was no statistically significant difference in phlegmonous appendicitis and perforation rates. Sparing appropriate time to each patient resulted in a statistically significant decline in negative laparotomy rates. Through the early non-complicated phase, diagnosis, and treatment, patients' hospital stay decreased significantly.

To reduce inappropriate emergency service appeals, public awareness regarding "emergency" should be constructed. Tertiary emergency services should not be occupied for disorders that could be solved in primary health care centers. Triage practices should be enhanced and overcrowding with medically non-emergent patients in emergency services should be prevented.

As a result, emergency services which are the most important column of the whole healthcare system will perform better if inappropriate admissions can be stonewalled. Patients will be diagnosed sooner, so the workload of related branches will diminish. The motivation of healthcare professionals will increase and healthcare service quality will enhance. Inadequate emergency service admissions should be minimized to decrease healthcare expenses and favor both healthcare professionals and patients.

**Financial Disclosure:** The authors have no financial relationships relevant to this article to disclose.

**Conflict of Interest:** The authors have no conflicts of interest to disclose.

**Author Contributions:** Conception: C.K., A.B.O., Design: C.K., A.B.O., Materials: C.K., A.B.O., S.C.O., Data Collection and/or Processing: C.K., A.B.O., S.C.O., Analysis and/or Interpretation: C.K., Literature Review: C.K., A.B.O., Writer: C.K., A.B.O.

## References

1. Pope D, Fernandes C, Bouthillette F, Etherington J. Frequent users of the emergency department: A program to improve care and reduce visits. *CMAJ* 2000; 162: 1017-20.
2. Brousseau DC, Mistry RD, Alessandrini EA. Methods of categorizing emergency department visit urgency: A survey of pediatric emergency medicine physicians. *Pediatr Emerg Care* 2006; 22: 635-9.
3. Afi lalo M, Guttman A, Colacone A, Dankoff J, Tselios C, Beaudet M, et al. Emergency department use and misuse. *J Emerg Med* 1995;

13: 259-64.

4. Baker DW, Stevens CD, Brook RH. Patients who leave a public hospital emergency department without being seen by a physician. Causes and consequences. *JAMA* 1991; 266: 1085-90.
5. Poortman P, Lohle PN, Schoemaker CM, Oostvogel HJ, Tepen HJ, Zwinterman VA, et al. Comparison of CT and sonography in the diagnosis of acute appendicitis: A blinded prospective study. *AJR Am J Roentgenology* 2003; 181: 1355-9.
6. Axelrod DA, Sonnad SS, Hirschl RB. An economic evaluation of sonographic examination of children with suspected appendicitis. *J Pediatr Surg* 2003; 35: 1236-41.
7. Campell JPM, Gunn AA. Plain abdominal radiographs and acute abdominal pain. *Br J Surg* 1988; 75: 554-86.
8. Kniskern JH, Eskin EM, Fletcher HS. Increasing accuracy in the diagnosis of acute appendicitis with modern diagnostic techniques. *Am Sur* 1986; 52: 222-5.
9. Halfon N, Newacheck PW, Wood DL, St Peter RF. Routine emergency department use for sick care by children in the United States. *Pediatrics* 1996; 98: 28-34.
10. Doobinin KA, Heidt-Davis PE, Gross TK, Isaacman DJ. Non urgent pediatric emergency department visits: Care-seeking behavior and parental knowledge of insurance. *Pediatr Emerg Care* 2003; 19: 10-4.
11. Boran P, Tokuç G, Çoban Büyükkalfa D, Taşkın B, Pişgin B. Çocuk acil servisine başvuran vakaların değerlendirilmesi. *Çocuk Dergisi* 2008; 8: 114-6.
12. Kinnear N, Heijkoop B, Bramwell E, Frazetto A, Noll A, Patel P, et al. Communication and management of incidental pathology in 1,214 consecutive appendectomies; a cohort study. *Int J Surg* 2019; 72: 185-91.
13. Orthopoulos G, Santone E, Izzo F, Tirabassi M, Pérez-Caraballo AM, Coriveau N, et al. Increasing incidence of complicated appendicitis during COVID-19 pandemic. *Am J Surg* 2021; 221: 1056-60.