



# Why is the rate of perforated appendicitis higher in girls in eastern Turkey, unlike the literature?

Türkiye'nin doğusunda perforated apandisit oranı dizinin aksine kız çocuklarda neden daha yüksek?

● Veli Avci, ● Kemal Ayengin

Department of Pediatric Surgery, Van Yüzcüncü Yıl University Faculty of Medicine, Van, Turkey

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## Abstract

**Aim:** Appendicitis is the most common cause of surgical abdominal pain in children. The incidence of appendicitis is higher in boys than girls. Delay in diagnosis may result in perforation of the appendix. Aim of this study is, to examine the terms of gender distribution of perforated appendicitis cases in eastern Turkey.

**Material and Methods:** Patients who underwent appendectomy in our clinic between the years of 2017–2018 were classified according to histopathology results as acute appendicitis and perforated appendicitis. Two groups was evaluated in term of; the age, gender, and length of hospital stay.

**Results:** Of the patients included in the study, 168 were male and 99 were female. The incidence of perforated appendicitis was higher in girls (%59), ( $p=0,001$ ) and acute appendicitis was higher in boys (%63), ( $p=0,001$ ). The mean age was  $11.44\pm 3.50$  years in acute appendicitis and  $9.22\pm 4.26$  years in perforated appendicitis. In perforated appendicitis, the mean length of hospital stay (6,73 day) was longer than acute appendicitis (2,59 day) ( $p=0,001$ ). In addition, the mean length of hospital stay (8,13 day) for girls with perforated appendicitis was statistically significantly longer than boys (6,03 day), ( $p=0,001$ ).

**Conclusion:** While diagnosing appendicitis in the east of Turkey; living environment of the child, education level of the family, socioeconomic status and cultural structure of the society must be considered. It should not be forgotten that the rate of perforated appendicitis in girls is higher than boys in this region.

**Keywords:** Appendicitis, eastern Turkey, girl, perforation

## Öz

**Amaç:** Apandisit çocuklardaki en sık cerrahi karın ağrısı nedenidir. Erkek çocuklarda sıklığı kız çocuklarından daha yüksektir. Tanıdaki gecikmeler apandiksin perforasyonu ile sonuçlanabilir. Bu çalışmada amaç, Türkiye'nin doğusundaki perforated apandisit olgularının cinsiyet açısından dağılımını irdelemektir.

**Gereç ve Yöntemler:** 2017–2018 yılları arasında kliniğimizde apandektomi yapılan hastalar histopatoloji sonuçlarına göre akut apandisit ve perforated apandisit olarak iki gruba ayrıldı. Bu iki grupta hastaların yaşı, cinsiyeti ve hastanede yatış süresi arasındaki ilişki değerlendirildi.

**Bulgular:** Çalışmaya alınan hastaların 168'i erkek, 99'u kız idi. Erkek çocuklarda akut (%63), kız çocuklarda ise perforated apandisit (%59) sıklığı daha yüksek bulundu, ( $p=0,001$  ve  $p=0,001$ ). Akut olgularda ortalama yaş  $11,44\pm 3,50$  yıl iken, perforated apandisitlerde  $9,22\pm 4,26$  yıl olarak saptandı. Perforated apandisitlerde hastanede ortalama yatış süresi (6,73 gün), akut apandisitlerden (2,59 gün) daha yüksekti, ( $p=0,001$ ). Ayrıca perforated apandisit tanılı kız çocukların ortalama yatış süresi (8,13 gün) de erkek çocuklara (6,03 gün) nazaran istatistiksel olarak anlamlı bir şekilde yüksek bulundu, ( $p=0,001$ ).

**Çıkarımlar:** Türkiye'nin doğusunda apandisit tanısı konulurken çocuğun yaşadığı ortam, sosyoekonomik durumu, ailenin eğitim düzeyi ve yaşadığı toplumun kültürel yapısı göz önüne alınmalıdır. Bu bölgedeki kız çocuklarda perforated apandisit oranının erkek çocuklara nazaran daha yüksek olduğu unutulmamalıdır.

**Anahtar sözcükler:** Apandisit, perforasyon, Türkiye'nin doğusu, kız

## Introduction

Appendicitis is inflammation of the vermiform appendix and the most common cause for visiting the emergency department because of acute abdomen (1–3). The

difficulty in communication and physical examinations at times with children, and gynecologic problems in adolescent girls may reduce the rates of accurate diagnosis (4). Perforated appendix (PA) may develop due to delayed diagnosis. This increases the morbidity and mortality

Corresponding Author / Sorumlu Yazar: Veli Avci E-mail / E-posta: veliavci\_21@hotmail.com

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rates (5–7). In the literature, the incidence of appendicitis in children is higher in girls compared with boys (8, 9). In this study, we aimed to evaluate the sex distribution of cases of PA in the Eastern Anatolia region of Turkey.

### Material and Methods

This study was conducted in accordance with the principles outlined in the Declaration of Helsinki. In addition, local ethics committee approval was obtained from Yüzüncü Yıl University, Faculty of Medicine (Date: 02.16.2018, Decision number: 20).

The demographic data of the patients who presented to our clinic because of abdominal pain from Van and surrounding provinces between 2017 and 2018 and underwent appendectomy were examined. The histopathologic findings of the appendectomy materials were documented and recorded. The patients were divided into two groups as acute appendicitis (AA) and PA according to the histopathology results. In these two groups, the relationships between age, sex, and hospitalization time was examined.

### Statistical Analysis

Descriptive statistics are expressed as mean±standard deviation, minimum and maximum values for continuous variables, and as number and percentage for categorical variables. In the comparison by sex in terms of continuous variables (age, hospitalization time, and symptom period), a normality test was performed primarily and the Mann-Whitney-U test was conducted because normal distribution was absent. The Chi-square test was performed to determine the relationship between the groups and categorical variables. In calculations, the statistical significance level was set as 5% and the SPSS (Ver. 21) statistical package program was used for calculations.

### Results

One hundred sixty-eight of 267 patients who were included in the study were male and 99 were female (Table 1). The female/male ratio was found as 0.59. The PA/AA ratio was found as 0.58 in the boys, whereas it was higher in the girls (PA/AA=1.40). AA was found to be more significant in the boys and PA was found to be more significant in the girls ( $p=0.001$ ). The risk of PA was 2.26-fold higher in the girls than in the boys.

The mean age was  $11.44\pm 3.50$  (range, 4–17) years among patients with AA and  $9.22\pm 4.26$  (range, 2–17) years among those with PA (Table 2). The difference between appendicitis and the ages of the individuals was found to be statistically significant ( $p=0.012$ ); the mean age of patients with PA was found to be lower compared with patients with AA.

**Table 1. Distribution of the state of acute and perforated appendicitis by sex**

	Acute	Perforated
Sex		
Female		
Number	41	58
In-group %	41	59
Male		
Number	106	62
In-group %	63	37

Chi-square=10.146;  $p=0.001$ ; Odds Ratio (OR)=2.262, 95% Confidence Interval (CI)=1.363–3.753

**Table 2. Distribution of the state of acute and perforated appendicitis by age, symptoms, and hospitalization time**

	Mean±SD	Min.	Max.	p
Age				
Acute	$11.44\pm 3.50$	4	17	0.012
Perforated	$9.22\pm 4.26$	2	17	
Symptom days				
Acute	$1.69\pm 0.60$	1	4	0.001
Perforated	$3.56\pm 1.57$	1	10	
Hospitalization time				
Acute	$2.59\pm 0.84$	2	8	0.001
Perforated	$6.73\pm 2.44$	3	17	

SD: Standard deviation; Min.: Minimum; Max.: Maximum

The mean time to emergency department presentation was found as 1.69 days in the AA group and 3.56 days in the PA group (Table 2). In addition, the mean time to emergency department presentation was found to be longer (3.39 days) in girls compared with the boys (2.21 days).

The mean hospitalization time was found as 2.59 days in the AA group and 6.73 days in the PA group (Table 2). The hospitalization time was found to be significantly longer in the patients with PA compared with those with AA ( $p=0.001$ ). In addition, the mean hospitalization time was found to be statistically significantly longer in the girls with PA than in boys with PA ( $p=0.001$ ).

### Discussion

Appendicitis is the most common cause of abdominal pain requiring surgery in children (1–3). Therefore, pediatric surgeons hospitalize a significant portion of patients (approximately one-third) who present to the emergency department with abdominal pain and perform advanced diagnostic methods (10). Its incidence has been reported to range between 1% and 10% in children (11). Accurate

diagnosis is made only with a rate of 72–94%. These rates show that surgeons still have difficulty in diagnosing appendicitis (6, 12). Therefore, a detailed physical examination should be performed and appendicitis should be considered primarily in the differential diagnosis in all patients presenting to the emergency department with abdominal pain.

According to the literature, appendicitis occurs with a 1.1–2.9-fold higher rate in boys compared with girls (4). According to another study, AA was found with a significantly higher rate in boys than in girls (8). In our study, the incidence of AA was found to be significantly higher in boys, in accordance with the literature ( $p < 0.05$ ).

Appendicitis is considered as a progressive disease. Acute inflammation, necrosis or perforation may occur as a result of appendix obstruction (13, 14). Morbidity and mortality rates increase when perforation develops (5–7, 14). This naturally increases the hospitalization time. In our study, it was observed that the hospitalization time was significantly longer in children with PA.

It has been reported that PA occurs more frequently in boys and the frequency of perforation is approximately 25–50% in children diagnosed as having appendicitis (4, 15). On the other hand, different studies conducted in two different centers reported that living in geographic regions with low socioeconomic and sociocultural level influenced the frequency of PA (5, 13). In our study, PA was found with a higher rate in girls ( $p < 0.05$ ), in contrast to the literature. We related this higher rate in the girls to the fact that the girls were brought to hospital later compared with the boys. The reason for this may probably be inadequate education of girls living in our region or the fact that families do not prioritize girls as much as boys. In addition, we believe that the shy personalities of girls living in rural regions may cause them to hide their symptoms from their parents, thus resulting in delayed presentation to healthcare institutions.

Ovarian pathologies, dysmenorrhea, and urinary tract infections, which occur more frequently in girls compared with boys, widen the spectrum in the differential diagnosis and may lead to missed diagnosis of appendicitis or misdiagnosis (8). Appendicitis, which is a focal pathology, may become a systemic pathology after misdiagnosis and lead to prolonged hospitalization, severe complications, and increased cost (15). Therefore, early and accurate diagnosis is vital in appendicitis.

In conclusion, it should be kept in mind that well-known gynecologic and urologic problems may overshadow the

diagnosis of appendicitis when making a diagnosis of appendicitis in girls living in the eastern part of Turkey. In addition, the living environment, socioeconomic status, the family's education level, the cultural structure of the community should be considered. We think that the information regarding the rates of PA being high in girls living in this region, should not be forgotten.

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**Ethics Committee Approval:** The study was approved by Yüzüncü Yıl University, Faculty of Medicine local ethics committee (Date: 02.16.2018, Decision number 20).

**Informed Consent:** Written consent was not obtained from the patients' parents, because all patients included in the study were evaluated retrospectively.

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