PREVALENCE OF APPENDICULAR PERFORATION AMONG PATIENTS UNDERGOING EMERGENCY APPENDECTOMY AT A TERTIARY CARE HOSPITAL

Sudip Shrestha, Shardul Bhattarai, Bhanu Pratap Singh, Sunil Shrestha

Department of Surgery, Nepal Medical College and Teaching Hospital, Attarkhel, Gokarneshwor-8, Kathmandu, Nepal

ABSTRACT

Appendicitis is a common cause of abdominal pain, and misdiagnosis or delayed diagnosis of acute appendicitis leads to perforation, postoperative complications, and an increased length of hospital stay. A retrospective study was performed at the Department of Surgery, Nepal Medical College Teaching Hospital, Gokarneshwor Municipality-8, Kathmandu, from Jan 2020 to Dec 2022, involving 235 patients who fulfilled the inclusion criteria. In our 3-year study, 235 patients (139 males and 96 females) underwent emergency appendectomy. Pain was present in all patients, with a mean duration of 24.89 ± 6.835 hours and a WBC ranging from 9,600 to 18,400 cells/mm^3. The average luminal diameter was 9.362 ± 1.3 mm. A total of 22 patients (9.4%) had a perforated appendix. Perforation was more common among males. Similarly, perforated patients presented with pain for 24.5 ± 7.7 hours and a WBC of 15,454 ± 1818.044 cells/mm^3. Imaging revealed the luminal diameter of 10.7 ± 1.069 mm. The prevalence of perforation among patients with appendicitis was relatively low with higher male-to-female ratio and a substantial portion of patients occurring in the 18-23 years age group.

KEYWORDS

Appendicitis, luminal diameter, perforation, WBC

CORRESPONDING AUTHOR

Dr. Sudip Shrestha
Lecturer,
Department of Surgery,
Nepal Medical College and Teaching Hospital,
Attarkhel, Gokarneshwor-8, Kathmandu, Nepal
Email: sudip1987@gmail.com
Orcid No: https://orcid.org/0000-0002-7248-6391
DOI: https://doi.org/10.3126/nmcj.v27i4.88110

***Received on**: September 4, 2025*
***Accepted for publication**: November 17, 2025*

Cite this paper as: Shrestha S, Bhattarai S, Singh BP, Shrestha S. Prevalence of appendicular perforation among patients undergoing emergency appendectomy at a tertiary care hospital. *Nepal Med Coll J* 2025; 27: 321-4.

INTRODUCTION

Acute appendicitis is the most common cause of acute abdominal pain and requires surgical treatment.[1] The general lifetime risk of occurrence of appendicitis is 8.6% for males and 6.7% for females.[2] In the majority of cases, the diagnosis of appendicitis is made clinically.[1] Ultrasonography (USG) should be the first-line imaging modality for all ages, and if equivocal USG findings or clinical-radiological dissociation are observed, further imaging, such as computed tomography (CT) scan or magnetic resonance imaging (MRI), is recommended.[3] The misdiagnosis or delayed diagnosis of acute appendicitis leads to perforation, postoperative complications and an increased length of hospital stay.[4] There is a higher risk of perforation in children younger than 5 years of age and patients older than 65 years of age (45.0% and 51.0%, respectively).[5] An increase in the transverse diameter has been found to be a major factor leading to perforation.[6,7]

Early diagnosis and surgical treatment help surgeons preempt the progression of the disease to a perforation that is associated with increased morbidity.[1] The treatment of appendicitis with perforation is challenging for healthcare providers because of the associated course of management and reduction in complications. The main aim of this study was to find out the prevalance of perforation in the appendix in patients who presented with appendicitis at a tertiary care hospital.

MATERIALS AND METHODS

This descriptive retrospective study was performed in the Department of Surgery at Nepal Medical College Teaching Hospital (NMCTH) from January 2020 to December 2022. Ethical approval for this study was obtained from the Research and Institutional Review Committee of NMCTH. All patients above 16 years of age with a clinicoradiological diagnosis of acute appendicitis who underwent emergency appendectomy were included in this study. Patients under 16 years of age, elective appendectomy and patients with conservative management were excluded. Intraoperative finding of ruptured appendiceal wall was considered as perforated appendix.

The sample size was calculated using the formula:
$n = Z^2 p (1-p)/d^2$ where,
n = sample size
Z = reliability coefficient (1.96 for 95% confidence interval)
p = Prevalence of appendicular perforation
d = Absolute error (5% taken for this study)

In a study by Timilsina BD *et al.*[8] among patients with appendicitis, 18.86% were diagnosed with perforated appendicitis.

$$\text{Sample Size (n)} = \frac{(1.96)2 \times 0.188 \times 0.812}{0.05 \times 0.05} = 235$$

The collected data were processed using MS Excel and exported to SPSS-16, for further analysis. Descriptive statistics were measured as mean and standard deviation.

RESULTS

In our 3-year study, 235 patients underwent emergency appendectomy; 139 were male with a mean age of 29.47 ± 13.75 years and 96 were female with a mean age of 33 ± 16.2 years. Pain was present in all patients, with a mean duration of 24.98 ± 6.835 hours (within the 95% confidence interval). WBC counts ranged from 9,600 cells/mm^3 to a 18,400 cells/mm^3. The average luminal diameter among all cases was 9.36 ± 1.30 (with 95% confidence interval). A total of 22 patients (9.4%) had perforated appendices. Perforation was more common among males. Perforated patients presented with pain for 25.5 ± 7.7 hours and WBC of 15,454 ± 1818.044 cells/mm^3. Imaging revealed an increase in the luminal diameter of 10.7 ± 1.069 mm among the perforated cases.

Table 1: Clinicoepidemiological characteristics of study population

	Non-perforated (n=213)	Perforated (n=22)	Total (n=235)
Age (years)	31.16 ± 14.95	28.50 ± 13.9	30.91 ± 6.38
Sex			
Male	123	16	139
Female	90	6	96
WBC count (cells/mm^3)	14648 ± 1773	15,454 ± 1818.044	14724 ± 1252
Duration of pain	24.92 ± 6.75	25.5 ± 7.7	24.98 ± 6.835
Luminal diameter (mm)	9.224 ± 1.24	10.7 ± 1.069	9.36 ± 1.3

DISCUSSION

Among the cases of appendicitis, it was evident that 9.4% of participants (n=22) presented with appendix perforation. This figure is lower than the 20.0% (n=133) found in the study by Ahmad *et al*.[9] Similarly, a study by Baloch *et al*.[10] revealed that complications of appendicular perforation and peritonitis were observed in 37.5% of patients. This finding revealed a decreased incidence of appendicular perforation in our study. A lower prevalence of perforation was also reported by Belbase *et al*,[11] who reported a low prevalence of 20.0%. These variations may be due to improved access to hospitals, education, awareness, and immediate management.

Among the 22 patients with perforated appendices, 72.0% (n=16) were male, while 28.0% (n=6) were female. In this study, the risk of perforation was greater in males than in females, for a 3:1 ratio. A retrospective analysis conducted by Barreto *et al*[12] revealed that male patients, especially those of ascending age and other risk factors, had an increased risk of appendix perforation. These findings were also replicated by Drake *et al*,[13] Barreto *et al*[1] and Balogun *et al*.[9] This can be due to various factors, such as an increased risk of exposure to alcohol in male-dominated occupations, traditional gender roles and expectations, which can lead to males being less likely to seek medical attention promptly.

Analysis of the luminal diameter with perforation revealed that the luminal diameter of the appendix was greater in patients with perforated appendicitis. The average diameter of the appendix among all the patients was 9.36 ± 1.30 mm. The average diameter of patients with appendix perforation was 10.7 ± 1.069 mm, and the average diameter of the non-perforated appendix was 9.22 ± 1.24 mm. This finding may suggest that a greater luminal diameter may result in a greater incidence of appendicular perforation. Similar findings can be found in studies by Bixby *et al*.[15] The average diameter was 15.1 mm in the perforated appendix and 11 mm in the non-perforated appendix. Similar findings were observed in retrospective studies by Kim *et al*[16] and Katipoglu *et al*.[17] An obstruction can cause appendicitis to occur, leading to an increase in intraluminal and intramural pressure, resulting in small vessel occlusion and lymphatic stasis. Once obstructed, the appendix fills with mucus and becomes distended, and as lymphatic and vascular compromise advances, the wall of the appendix becomes ischemic and necrotic. This can lead to appendix perforation.[18]

The limitations of this study are that it is a single-centered retrospective study for prevalence with relatively small sample size. Only cases managed operatively were included in the study excluding conservatively managed cases. The study was based on intraoperative findings without correlating with imaging or histopathological findings, which would lead to diagnostic misclassification.

Our study provides significant insights into appendicitis, revealing a reduced incidence of appendicular perforation, which was observed in only 9.4% of patients. Compared with nonperforated patients, perforated patients presented with a slightly larger luminal diameter and a greater WBC count. The significance of these findings highlights the need for ongoing research to facilitate tailored care strategies in the management of appendicitis. Emphasis on early detection and intervention is paramount for preventing appendicular perforation and improving patient outcomes.

ACKNOWLEDGEMENTS

The authors would like to thank all those who contributed in the completion of this study.

Conflict of interest: None

Source of research fund: None

REFERENCES

1. Prystowsky JB, Pugh CM, Nagle AP. Appendicitis. *Curr Probl Surg* 2005; 42: 694–742.
2. Addiss DG, Shaffer N, Fowler BS, Tauxe RV. The epidemiology of appendicitis and appendectomy in the United States. *Am J Epidemiol* 1990; 132: 910–25.
3. Debnath J, George RA, Ravikumar R. Imaging in acute appendicitis: What, when, and why? *Med J Armed Forces India* 2017; 73: 74–9.
4. Harada T, Harada Y, Hiroshige J, Shimizu T. Factors associated with delayed diagnosis of appendicitis in adults: A single-center, retrospective, observational study. *PLoS ONE* 2022; 17: e0276454.
5. Brunicardi FC, Andersen DK, Billiar TR, Dunn DL, Hunter JG. Schwartz's principles of surgery. Tenth edition. New York: McGraw-Hill Education; 2014.

6. Tantarattanapong S and Arwae N. Risk factors associated with perforated acute appendicitis in geriatric emergency patients. *Open Access Emerg Med* 2018; 10: 129–34.
7. Webb EM, Wang ZJ, Coakley FV, Poder L, Westphalen AC, Yeh BM. The equivocal appendix at CT: prevalence in a control population. *Emerg Radiol* 2010; 17: 57–61.
8. Timilsina BD, Karki O, Subedi B. Perforated appendicitis treated by open versus laparoscopic surgery- a comparative study. *Nepal Mediciti Med J* 2021; 2: 14–7.
9. Ahmad T and Ali Z. Perforated appendix: contributing factors. *J Univ Med Dent Coll* 2010; 1: 11–6.
10. Baloch I, Bhatti Y, Abro H. Complications of acute appendicitis: a review of 120 cases. *Pak J Med Res* 2009; 48: 91-3.
11. Belbase NP, Khatiwada S, Bhujel S, Gupta R, Upadhyay HP, Belbase D. Spectrum of gastrointestinal perforations in a tertiary care hospital of central Nepal: an analytical cross-sectional study. *J Soc Surg Nepal* 2022; 25: 58–62.
12. Barreto S, Travers E, Thomas T, *et al*. Acute perforated appendicitis: an analysis of risk factors to guide surgical decision making. *Indian J Med Sci* 2010; 64: 58–65.
13. Drake FT, Mottey NE, Farrokhi ET *et al*. Time to appendectomy and risk of perforation in acute appendicitis. *J Amer Med Assoc Surg* 2014; 149: 837-44.
14. Lotfollahzadeh S, Lopez RA, Deppen JG. Appendicitis. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2025. Available from: https://www.ncbi.nlm.nih.gov/books/NBK493193/. (Updated 2024 Feb 12)
15. Bixby SD, Lucey BC, Soto JA, Theysohn JM, Ozonoff A, Varghese JC. Perforated versus nonperforated acute appendicitis: accuracy of multidetector CT detection. *Radiology* 2006; 241: 780–6.
16. Kim MS, Park HW, Park JY *et al*. Differentiation of early perforated from nonperforated appendicitis: MDCT findings, MDCT diagnostic performance, and clinical outcome. *Abdom Imaging* 2014; 39: 459–66.
17. Katipoglu B, Aygun A, Çınar H. The effect of appendix diameter on perforation in acute appendicitis cases. *Cumhur Med J* 2019: 392-7
18. Abdul Jawad K, Qian S, Vasileiou G *et al*. Microbial epidemiology of acute and perforated appendicitis: a Post-Hoc analysis of an EAST multicenter study. *J Surg Res* 2022; 269: 69–75.