Original article

Clinical profile of acute appendicitis at the National Referral Hospital in Bhutan

Thukten Chophel, Sangay Tshering, Namkha Dorji, Thinley Dorji, Sithar Dorjee, Tashi Tenzin

Abstract

Introduction: Acute appendicitis poses a diagnostic challenge in a low-resource setting like ours. Without timely and appropriate management, acute appendicitis can lead to prolonged morbidity and mortality. We describe the clinical profile of acute appendicitis at the national referral hospital in Bhutan.

Methods: This was a cross-sectional descriptive study of all cases of acute appendicitis managed at the National Referral Hospital, Bhutan from 1st January-31st December 2016. Data related to patients' symptoms, clinical examination and ultrasonographic findings, treatment details, length of hospital stay, and histopathology report were analyzed.

Results: Of the 3291 surgical admissions, there were 173 patients with acute appendicitis contributing to 5.3% of the total surgical burden. The median age was 27 years (IQR 20, 39), 60.1% were males. 96.5% and 91.9% of the patients presented with right iliac fossa pain and tenderness respectively. While 74.6%(n=129) had primary surgery, 18.9%(n=32) were managed conservatively. Of the 32 patients, 37.5%(n=12) had surgery after failed conservative management. Seventy-five percent presented with intraoperative features of complicated appendicitis. The negative appendectomy rate was 2.2%. The median length of hospital stay was three days (range 3–60). Ultrasonographic diagnosis compared to histopathological confirmation had a sensitivity of 87.8%, kappa agreement of 87.3%, and specificity of 66.7%.

Conclusion: Acute appendicitis is a common surgical emergency. Ultrasonography in the diagnosis of acute appendicitis was useful in a low-resource setting. A high proportion of complicated acute appendicitis in our setting needs effective interventional strategies.

Keywords: Acute appendicitis; Bhutan; Surgery; Ultrasonography.

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Introduction

Appendicitis is a highly prevalent disease and a common surgical emergency.[1–3] Since 2000, the pooled incidence of appendicitis or appendectomy in newly industrialized countries including those in Asia is on the rise (60–206 per 100,000 person-years) and is higher than in many Western countries.[2,4] While acute appendicitis is common in adolescents, it is also seen among older adults in whom the diagnosis may be delayed or missed.[4,5] The incidence of appendicitis and complication is substantially higher among persons from lower-income groups adding to increased costs of treatment.[6] Untreated appendicitis leads to significant morbidity and mortality as can an appendectomy with a normal appendix.[1,2,7] Common presenting symptoms of acute appendicitis are right lower quadrant pain, anorexia, nausea, and vomiting. Physical examination findings include fever, McBurney's point tenderness, and rebound tenderness.[3,7] Early symptoms of appendicitis, atypical presentations, and disease in children lead to delays in diagnosis leading to complications.[3,8] Correct diagnosis of acute appendicitis is based on clinical history, physical examination, and basic laboratory and ultrasound imaging.[9,10] Computed Tomography or Magnetic Resonance Imaging and other modalities of diagnoses are reserved only for selected cases.[8,11]

The aim of our study was to describe the clinical profile of acute appendicitis in our hospital. In addition, we evaluated the diagnostic performance of ultrasonography in diagnosing acute appendicitis in our setting.

Methods

This was a cross-sectional descriptive study conducted in all patients with acute appendicitis admitted at the Department of Surgery, Jigme Dorji Wangchuck National Referral Hospital, Thimphu from 01 January to 31 December 2016. All patients with the clinical diagnosis of acute appendicitis were enrolled in the study. The data on variables were extracted from the patient files using the citizenship identity card number and entered into a structured Pro-forma. Variables included demography, clinical profile, investigations, diagnostic modality, treatment and classification system. Once diagnosed, acute appendicitis is managed with open surgery or conservative management.[1,12,13] As per the departmental protocol, those patients with stable vital parameters are initially managed with intravenous antibiotics for 72 hours and observed for clinical improvement. Those with persistent pain or fever, tachycardia, or rising leukocytosis are subsequently taken up for surgery. McBurney's incision was performed for unruptured appendicitis. Patients with ruptured appendicitis or abscess are treated with primary surgery via a midline incision. Surgical specimen from an appendectomy is sent for histopathological examination. Appendicitis was classified as an uncomplicated or complicated case based on the intraoperative findings. Complicated appendicitis were those with gangrene or ruptured appendix, periappendiceal mass, or the presence of intra-abdominal abscesses or peritonitis. Those specimens with histological evidence of inflammation or presence of fecoliths were considered positive for appendicitis; those with normal microscopy and no evidence of inflammation or fibrous obliteration were considered negative for appendicitis.[14]

Data were entered into EpiData (version 3.1 for entry, EpiData Association, Odense, Denmark) and analyzed using STATA (version 13.0, StataCorp LP USA). Duplication of data from readmission following recurrent appendicitis or complications was excluded at this point. Continuous variables are presented as means/medians and categorical variables are presented as frequencies and percentages. The sensitivity and specificity of clinical examination findings of acute appendicitis and diagnostic agreement with ultrasonography and histopathology results (confirmatory diagnosis) were tested using kappa statistics. The length of hospitalization required for different clinical conditions of appendicitis was compared using either two-sample Wilcoxon rank-sum or Kruskal-Wallis test. For measuring the association between two categorical variables, the chi-square test was used. Statistical significance was assessed at a 5% significance level. Ethical clearance was

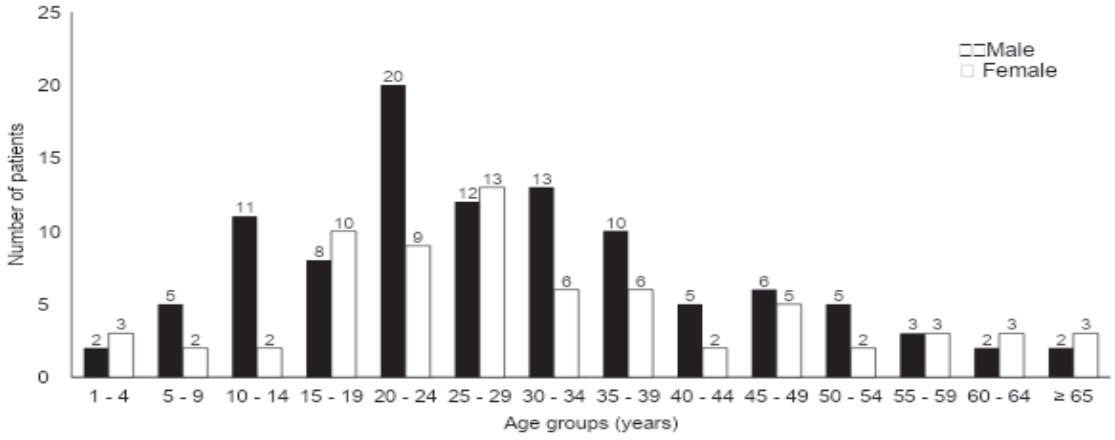

Figure 1. The age and sex distribution of patients treated for acute appendicitis

obtained from the Research Ethics Board of Health (REBH/Approval/2015/035 dated 12 December 2015), Ministry of Health, Bhutan. All study participants provided written informed consent allowing extraction of their clinical data. Prior permission was granted by the hospital administration.

Results

Of the 3291 surgical admissions, there were 173 patients with acute appendicitis contributing to 5.3% of the total surgical burden. The median age of patients with acute appendicitis was 27 years (IQR 20, 39; range 1–83 years); the highest number (29, 16.8%) of patients were in the age group 20–24 years; and 60.1% (n=104) were males (**Figure1**).

The most common presenting symptom- pain in the right iliac fossa was seen in 96.5% (n=167) and the most common physical examination finding- tenderness in the right iliac fossa was seen in 91.9% (n=159). Of the 90.2% (n=156) who were evaluated with ultrasonography for features of acute appendicitis, 66.7% (n=104) were reported as positive for acute appendicitis. (**Table 1**).

While 74.6%(n=129) had primary surgery, 18.9%(n=32) were managed conservatively. Of the 32 patients managed conservatively, 37.5%(n=12) had surgery after failed conservative management. Seventy-five percent (n=106) presented with intraoperative features of complicated appendicitis. The negative appendectomy rate was 2.2% (n=3) (**Table 2**)

Table 1. Presenting symptoms and clinical findings among patients diagnosed with acute appendicitis

Basic and clinical parameters		n	(%)
Symptoms			
	Right iliac fossa pain	167	(96.5)
	Nausea	130	(75.1)
	Loss of appetite	121	(69.9)
	Fever	119	(68.8)
	Peri-umbilical pain	115	(66.5)
	Vomiting	98	(56.6)
	Diarrhea	33	(19.1)
	Constipation	19	(11.0)
	Fever	68	(39.3)
Abdominal examination			
	Right iliac fossa tenderness	159	(91.9)
	Rebound tenderness	131	(75.5)
	Guarding	130	(75.1)
	Generalized tenderness	31	(17.9)
	Mass in right iliac fossa	29	(16.8)
Ultrasonographic diagnosis			
	Acute appendicitis present	104	(66.7)
	Peri-appendiceal mass	28	(17.9)
	Acute appendicitis absent	24	(15.4)

Table 2. Treatment modality, intraoperative findings, and histopathology diagnosis among patients treated for acute appendicitis

Treatment and surgical parameters		n	(%)
Modes of treatment			
	Primary surgical treatment	129	(74.6)
	Surgery after failed medical treatment	12	(6.9)
	Medical management	32	(18.5)
Surgical procedure			
	Uncomplicated appendectomy	67	(47.5)
	Complicated appendectomy	74	(52.5)
Surgical incision			
	Right lower quadrant incision	117	(83.0)
	Midline incision	24	(17.0)
Operative findings			
	Inflamed, non-ruptured appendix/ fecalith present	35	(24.9)
	Gangrenous and necrotic appendix	29	(20.6)
	Ruptured appendix	34	(24.1)
	Periappendiceal mass	34	(24.1)
	Periappendiceal abscess	2	(1.4)
	Multiple intra-abdominal abscesses	7	(4.9)
Histopathology diagnosis (n = 139)			
	Inflamed appendix	97	(69.8)
	Gangrenous appendix	26	(18.7)
	Chronic appendicitis	6	(4.3)
	Tuberculous appendicitis	5	(3.6)
	Eosinophilic appendicitis	2	(1.4)
	Normal appendix	3	(2.2)

Table 3. Duration of hospital stay among patients treated for acute appendicitis

Parameter		Median (days)	Range (days)	p-value
Modality of treatment				
	Surgical	3	2 – 60	0.940*
	Conservative	3	2 – 8	
Types of complications				
	Gangrenous/ necrotic appendicitis	4	2 – 60	0.378**
	Inflamed/ Non-ruptured appendicitis	3	3 – 12	
	Ruptured appendicitis	3	2 – 60	
Site of incision				
	Midline	2	4 – 60	0.001*
	Right lower quadrant	2	3 – 7	

*Wilcoxon rank-sum test
**Kruskal-Wallis test

Table 4. The sensitivity, specificity, and kappa agreement of clinical findings and ultrasonography in the diagnosis of acute appendicitis compared against histopathology confirmation among patients treated for acute appendicitis

Clinical and ultrasound parameters		Histopathology of the surgical specimen		Sensitivity (%) (95% CI)	Specificity (%) (95% CI)	Positive predictive value (%) (95% CI)	Negative predictive value (%) (95% CI)	Kappa agreement (%)
		Appendicitis	No appendicitis					
Right iliac fossa pain	Present	131	3	96.3 (91.6 – 98.8)	0.0 (0.0 – 70.8)	97.8 (93.6 – 99.5)	0.0 (0.0 – 52.2)	94.2
	Absent	5	0					
Right iliac fossa tenderness	Present	123	3	90.4 (84.2 – 94.8)	3 (0.0 – 70.8)	97.6 (93.2 – 99.5)	0.0 (0.0 – 24.7)	88.5
	Absent	13	0					
Acute appendicitis on ultrasonography	Present	108	1	87.8 (80.7 – 93.0)	66.7 (9.4 – 99.2)	99.1 (95.0–100.0)	11.8 (1.5 – 36.4)	87.3
	Absent	15	2					

The median duration of hospital stay was three days for both the surgery and conservative management. There was no difference in the duration of hospital stay based on the modality of treatment (surgery vs conservative, p = 0.9) and based on the type of complications (complicated vs uncomplicated, p = 0.4). Among patients treated with surgery, those who received midline incision had a significantly longer duration of hospital stay (p = 0.001) (**Table 3**).

The kappa agreement between right iliac fossa pain and tenderness compared to ultrasonography findings of acute appendicitis were 80.1% and 75.6% respectively. Ultrasonography had sensitivity of 87.8% (95% CI: 80.7–93.0%) and specificity of 66.7% (95% CI: 9.4–99.2%) with kappa agreement of 87.3% with histopathological confirmation (**Table 4**).

Discussion

Our hospital based study showed an incidence of 86.7% for acute appendicitis under the age of 50 years.[15] This is similar to a hospital based study in Nepal which cited incidence of appendicitis at 87.4%. Although we cannot ascertain the reason for the high incidence of acute appendicitis in the Bhutanese population, the low dietary fiber coupled with higher meat consumption could possibly explain the finding.[6] The frequencies of symptoms and abdominal examination findings were similar to those reported in reviews.[7,8] Owing to similar geographical topography and delayed referral, Nepal also cited higher proportion of complicated appendicitis like ours.[15] Following the referral pathways from districts, most of the patients experience a delay in reaching the surgical centers thereby leading to complicated appendicitis. However the delay factor has not been studied in our study Although meta-analysis has shown benefits of conservative management with the antibiotic-first approach in uncomplicated appendicitis, this cannot hold true in our context given the delays in referral to surgical centers and subsequent complications.[16] This also explains why conservative management in our setting has a higher failure rate compared to the 8% cited in the literature.[1] Although Primary healthcare centers are accessible to more than 95% of the population within a walking distance of three hours, delay in diagnosis and referral adds to the higher proportion of complicated appendicitis and failed conservative management.[17] We also need to revisit our management protocol given the higher failure rate of conservative management and complicated appendicitis. The negative appendectomy rate in our study is lower compared to other studies.[11,14] We did not routinely remove a healthy-looking appendix unless no other probable pathology could explain the acute abdomen. The higher proportion of complicated appendicitis in our setting may also explain the lower negative appendectomy rate.

While clinical prediction scores have limitations in the diagnosis of acute appendicitis, especially when evaluated by general physicians, additional diagnostic tools such as ultrasonography may be made available in primary health centers for early diagnosis and timely referral of patients with acute appendicitis.[1,18] This is particularly important because complicated appendicitis had a significantly longer duration of hospital stay thereby leading to a higher cost of treatment for the government. From our study, the symptom of pain and clinical finding of tenderness in the right iliac fossa had high sensitivity and high kappa agreement with histopathologic confirmation, but zero specificity. Clinical symptoms and signs of acute appendicitis have poor positive predictive value when interpreted alone and no single history, physical examination, laboratory finding can eliminate the need for imaging studies.[3,9] Systematic reviews have shown that clinical diagnostic tools such as the Alvarado score in adults and the Paediatric Appendicitis Score in children do not eliminate the need for additional diagnostic tests and imaging.[8,9]

In resource-limited settings, ultrasonography is more readily available at a lower cost compared to CT and MRI. In Bhutan, among the six surgical centers, ultrasonography is available in all centers while CT is available in three and MRI is available only at the National Referral Hospital. Ultrasonography is non-invasive and a reproducible diagnostic modality that is not associated with any major risks to the patients.[10] Ultrasonography is the preferred imaging modality in children and pregnant and breastfeeding women where diagnostic accuracy has been improved with the use of specific ultrasonographic criteria and repeated scans.[8] In children, ultrasonographic

evaluation at point-of-care in the emergency department has a positive likelihood ratio of 9.24 (95% CI 6.24–13.28) and can be used to rule in acute appendicitis without the use of CT or MRI.[9] Point-of-care ultrasonography by emergency physicians is reliable and has a positive impact on clinical decision-making.[9,19,20] This reflects an urgent need to provide additional training to ultrasonographers and emergency physicians to improve their skills and enhance the uptake of point-of-care ultrasound of the appendix.[1] Since ultrasonography is performed by technicians in most cases, our study yielded a lower sensitivity and specificity of ultrasonography compared to global estimates. Under the auspices of the present government, ultrasonography facilities have expanded to more remote areas. The country has opened four more fully functional surgical centers in strategic locations. Minimally invasive surgery in appendicitis has been instituted at the regional and national referral hospitals thereby allowing early diagnosis, treatment and early discharge. All these strategies would go a long way in reducing the surgical burden, early diagnosis, and timely treatment of acute appendicitis thereby improving the quality of care.

This was the first hospital-based study on acute appendicitis in Bhutan. The data generated and analyzed in this study would serve as baseline data for further improvement in management protocol, health policy, and planning. Since the study did not analyze the outcome of management of acute appendicitis, we were not able to comment on the complications of treatment. We also could not generalize the result to find out the incidence of acute appendicitis at the national level.

Conclusion

Acute appendicitis is a common surgical emergency. Apart from clinical acumen, ultrasonography in the diagnosis of acute appendicitis was useful in a low-resource setting. A high proportion of complicated acute appendicitis in our setting needs effective interventional strategies.

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References

1. Di Saverio S, Podda M, De Simone B, Ceresoli M, Augustin G, Gori A, et al. Diagnosis and treatment of acute appendicitis: 2020 update of the WSES Jerusalem guidelines. World J Emerg Surg. 2020;15(1):1–42.
2. de Wijkerslooth EML, van den Boom AL, Wijnhoven BPL. Disease burden of appendectomy for appendicitis: a population-based cohort study. Surg Endosc [Internet]. 2020;34(1):116–25. Available from: https://doi.org/10.1007/s00464-019-06738-6
3. Bhangu A, Søreide K, Di Saverio S, Assarsson JH, Drake FT. Acute appendicitis: modern understanding of pathogenesis, diagnosis, and management. Lancet (London, England). 2015 Sep;386(10000):1278–87.
4. Ferris M, Quan S, Kaplan BS, Molodecky N, Ball CG, Chernoff GW, et al. The Global Incidence of Appendicitis: A Systematic Review of Population-based Studies. Ann Surg. 2017 Aug;266(2):237–41.
5. Pereira B, Mendes CA, Ruano RM, Neves I, Curado RL, Oliveira R de, et al. Acute appendicitis may no longer be a predominant disease of the young population. Anaesthesiol Intensive Ther. 2019;51(4):283–8.
6. Lin KB, Chan CL, Yang NP, Lai RK, Liu YH, Zhu SZ, et al. Epidemiology of appendicitis and appendectomy for the low-income population in Taiwan, 2003-2011. BMC Gastroenterol. 2015;15(1):1–13.
7. Baird DLH, Simillis C, Kontovounisios C, Rasheed S, Tekkis PP. Acute appendicitis. BMJ. 2017 Apr;357:j1703.
8. Kabir SA, Kabir SI, Sun R, Jafferbhoy S, Karim A. How to diagnose an acutely inflamed appendix; a systematic review of the latest evidence. Int J Surg [Internet]. 2017;40:155–62. Available from: http://dx.doi.org/10.1016/j.ijsu.2017.03.013
9. Benabbas R, Hanna M, Shah J, Sinert R. Diagnostic Accuracy of History, Physical Examination, Laboratory Tests, and Point-of-care Ultrasound for Pediatric Acute Appendicitis in the Emergency Department: A Systematic Review and Meta-analysis. Acad Emerg Med. 2017;24(5):523–51.
10. Mostbeck G, Adam EJ, Nielsen MB, Claudon M, Clevert D, Nicolau C, et al. How to diagnose acute appendicitis: ultrasound first. Insights Imaging. 2016;7(2):255–63.
11. Sammalkorpi HE, Mentula P, Savolainen H, Leppäniemi A. The Introduction of Adult Appendicitis Score Reduced Negative Appendectomy Rate. Scand J Surg. 2017;106(3):196–201.
12. Annual Report 2020. Thimphu;Quality Assurance & Standardization Division;Jigme Dorji Wangchuck National Referral Hospital;2021.
13. Gorter RR, The S-MML, Gorter-Stam MAW, Eker HH, Bakx R, van der Lee JH, et al. Systematic review of nonoperative versus operative treatment of uncomplicated appendicitis. J Pediatr Surg. 2017 Aug;52(8):1219–27.
14. Chandrasegaram MD, Rothwell LA, An EI, Miller RJ. Pathologies of the appendix: a 10-year review of 4670 appendicectomy specimens. ANZ J Surg. 2012 Nov;82(11):844–7.
15. Menyangbo S, Bhatta G, Subedi K, Magar BP, Devkota H, Panta PP. Morbidity and Mortality

Pattern of Appendicitis in Rural Teaching Hospital of Nepal. Journal of Karnali Academy of Health Sciences. 2020;3(2).
16. Sallinen V, Akl EA, You JJ, Agarwal A, Shoucair S, Vandvik PO, et al. Meta-analysis of antibiotics versus appendicectomy for non-perforated acute appendicitis. Br J Surg. 2016;103(6):656–67.
17. Annual health bulletin 2020. Thimphu; Quality Assurance & Standardization Division;Ministry of Health;2021.
18. Kularatna M, Lauti M, Haran C, MacFater W, Sheikh L, Huang Y, et al. Clinical Prediction Rules for Appendicitis in Adults: Which Is Best? World J Surg. 2017 Jul;41(7):1769–81.
19. Matthew Fields J, Davis J, Alsup C, Bates A, Au A, Adhikari S, et al. Accuracy of Point-of-care Ultrasonography for Diagnosing Acute Appendicitis: A Systematic Review and Meta-analysis. Acad Emerg Med. 2017;24(9):1124–36.
20. Gungor F, Kilic T, Akyol KC, Ayaz G, Cakir UC, Akcimen M, et al. Diagnostic Value and Effect of Bedside Ultrasound in Acute Appendicitis in the Emergency Department. Acad Emerg Med. 2017;24(5):578–86.