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Post Operative Outcomes of Acute Perforated Appendix During Index Admission

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ABSTRACT

Acute perforated appendicitis is a serious condition associated with higher morbidity, prolonged hospital stays, and increased risk of complications. Understanding postoperative outcomes is crucial for optimizing patient care, improving clinical decision-making, and reducing healthcare burdens. **Objective:** To determine the postoperative outcomes of acute perforated appendicitis during index hospital admission. **Methods:** This descriptive study was conducted at the Department of Surgery, Khyber Teaching Hospital, Peshawar, from October 1, 2024, to July 31, 2025. Male and female patients aged 18 to 60 years diagnosed with acute perforated appendicitis were enrolled. The patients were evaluated for postoperative outcomes, recorded in terms of surgical site infection, wound dehiscence, hospital stay, and intestinal obstruction. Data analysis was carried out using SPSS version 26.0. **Results:** The Mean age of the participants was 33.91 ± 11.834 years, while the mean hospital stay was 7.12 ± 2.721 days. Most of the patients were male (n=101, 67.8%). Retrocecal position of the appendix was frequently recorded in 98 patients (65.8%). Hospital stay more than seven days was observed in 57 patients (38.3%), followed by surgical site infection (n=47, 31.5%). Wound dehiscence was the least frequently recorded in 21 patients (14.1%). **Conclusions:** Acute perforated appendicitis was associated with increased occurrence of postoperative complications and morbidities. Male patients with advanced age were more likely to experience prolonged hospital stay and surgical site infection.

INTRODUCTION

Acute appendicitis represents the most common clinical condition in emergency surgical departments. Diagnosis is largely clinically supported by various laboratory and imaging tools. Early diagnosis and prompt surgical intervention are the key treatments and prevent complications related to acute appendicitis [1]. Male patients have a slightly higher complication rate than female [2]. Luminal occlusion is the fundamental underlying mechanism for acute appendicitis and perforation. A fecolith is considered the most common cause of such blockage, implicated in approximately 90% of perforation cases. However, other etiologies of luminal obstruction exist, including lymphoid hyperplasia, parasitic infestations(e.g., worms), neoplasms, and foreign bodies [3, 4]. Complications related to acute appendicitis are common at the extreme of ages. The probability of appendicular perforation is twenty percent in the first and after the fourth decade of life [5]. Pre-existing medical conditions like diabetes increase the likelihood of complications and mortality. Among female, the complication rate increases during pregnancy [6-8]. While surgical intervention is the cornerstone in the management of acute appendicitis and perforation, conservative management with broad-spectrum

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antibiotics or minimal invasive techniques and supportive care may be considered in certain cases, such as very sick patients unfit for surgery or anesthesia. Nevertheless, irrespective of the management approach, perforated appendicitis is associated with increased morbidities and mortality [9]. In a study, 76 individuals (25.5%) experienced postoperative complications. The perforated appendicitis and non-perforated appendicitis groups had respective overall rates of complications of 38.02% and 15.49% ($p<0.001$). In the non-perforated group, the median length of hospital stay was statistically substantially less than in the perforated group (3 vs. 5 days; $p<0.001$) [10]. Despite advances in surgical techniques and perioperative care, perforated appendicitis remains a critical condition that often leads to increased risk of postoperative complications, which are seldom studied in the context of local settings. By analyzing these factors, the study identified potential areas for intervention to enhance postoperative recovery. The findings contributed to existing literature by providing updated evidence on the clinical course of perforated appendicitis in the contemporary surgical setting, ultimately guiding healthcare providers in delivering better patient-centered care.

This study aimed to determine the postoperative outcomes of acute perforated appendicitis during index hospital admission.

METHODS

This descriptive study was carried out at the Department of Surgery, Khyber Teaching Hospital (KTH), Peshawar, during the period 1st October 2024 till 31st July 2025, after taking approval from the hospital IRB vide no: 713/DME/KMC. Male and female patients aged 18 to 60 years diagnosed with perforated appendix were enrolled and evaluated for postoperative outcomes. Patients with intestinal perforation, severely cardiopulmonary compromised patients, immune-compromised patients, patients with appendicular mass, and pregnant patients were excluded. Perforated appendix was confirmed by clinical findings such as fever (core body temperature more than 38°C on thermometer) and pain (visual analogue scale score more than four), laboratory features including raised white cell count (total leucocyte count more than 10,000cells/mm3), positive inflammatory markers such as CRP, and an abdominal ultrasound abdomen confirming the presence of appendicular perforation. Post operative outcomes were assessed in the immediate postoperative period till 15 days after surgery, in terms of surgical site infection (defined by the appearance on redness and erythema of 1cm around the wound margin with seroanguinous discharge and culture of discharge revealing growth of microbes), wound dehiscence (defined as the total or complete separation of the wound margins leading to visible window in the wound on clinical examination), hospital stay (number of days spent at the hospital), intestinal obstruction (defined as presence abdominal pain, nausea/vomiting and X ray erect abdomen showing multiple air fluid levels). Sample size was 149, calculated using the WHO sample size calculator, taking the anticipated proportion of complications as 25.5%, 7% margin of error, and 95% confidence level [10]. The sampling technique was non-probability consecutive sampling. Participants were enrolled after approval from the hospital research review committee. Informed consent was obtained from enrolled participants after explaining the study, risks, benefits, and purpose. Baseline clinical and demographic data were gathered. All patients underwent exploratory laparotomy under general anesthesia. A midline incision was given, and the intra-abdominal cavity was exposed. A 10-cc sample was collected from an intra-abdominal collection, which was sent for culture and sensitivity. The collection was drained, and the abdominal cavity was thoroughly washed with normal saline. The appendix was thoroughly examined for the presence of perforation. Appendectomy was done, and further dissection was carried out depending upon the degree of gangrenous area. Drain was placed, and the abdomen was closed. Standard postoperative care was given to all patients, including adequate antibiotic care, analgesia, and fluids. Patients were evaluated for the next 15 days for postoperative outcomes. Data analysis was carried out using SPSS version 26.0. Continuous data were reported as means and standard deviations, and categorical data as frequencies and percentages. Outcome variables, including surgical site infection, wound dehiscence, and intestinal obstruction, were reported as frequencies and percentages, and hospital stay as means and standard deviations. Effect modifiers were controlled through stratification. Post-stratification chi-square test was applied, taking p-value≤0.05 as statistically significant.

RESULTS

The mean age of the participants was 33.91 ± 11.834 years, the mean pain duration was 34.35 ± 4.897 hours, while the mean hospital stay was 7.12 ± 2.721 days, as reported in table 1.

Table 1: Descriptive Statistics of Study Participants (n=149)

Parameters	Mean ± SD
Age (Years)	33.91 ± 11.83
Pain Duration (Hours)	34.35 ± 1.89
BMI (kg/m^2)	23.96 ± 2.60
Hospital Stay (Days)	7.12 ± 2.72

Participants aged less than 40 years were 107 (71.8%), while

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the majority of patients were male (n=101, 67.8%). Retrocecal position of the appendix was most frequently recorded in 98 patients (65.8%). 59 patients (39.6%) had abdominal collections of more than 150ml, and 101 patients (67.8%) underwent appendicectomy without any further dissection, as shown in table 2.

Table 2: Distribution of participants according to baseline characteristics(n=149)

Parameters	Subgroups	n (%)
Age (Years)	40 or below	107 (71.8%)
	Above 40	42 (28.2%)
Gender	Male	101 (67.8%)
	Female	48 (32.2%)
BMI (kg/m^2)	24.9 or below	98 (65.8%)
	Above 24.9	51 (34.2%)
Education	Matric or below	59 (39.6%)
	Above matric	90 (60.4%)
Profession	Employed	42 (28.2%)
	Unemployed	107 (71.8%)
Appendix position	Retrocecal	98 (65.8%)
	Pelvic	39 (26.2%)
	Pre/post ileal	12 (8.1%)
Collection (ml)	>150ml	59 (39.6%)
	<150ml	90 (60.4%)
Procedure	Appendicectomy	101 (67.8%)
	Right Hemi	36 (24.2%)
	Cecostomy	12 (8.1%)

Hospital stay more than seven days was observed in 57 patients (38.3%), followed by surgical site infection (n = 47, 31.5%). Wound dehiscence was the least frequently recorded in 21 patients (14.1%), as shown in table 3.

Table 3: Distribution of Postoperative Outcomes among Study Participants(n=149)

Postoperative Outcomes	Subgroups	Frequency (%)
Surgical Site Infection	Yes	47 (31.5%)
	No	102 (68.5%)
Wound Dehiscence	Yes	21 (14.1%)
	No	128 (85.9%)
Hospital Stay (Days)	7 or below	92 (61.7%)
	Above 7	57 (38.3%)
Intestinal Obstruction	Yes	30 (20.1%)
	No	119 (79.9%)

In patients aged 40 years or below, hospital stay more than 7 days was recorded in 27 patients (47.4%), compared to 30 patients (52.6%) aged more than 40 years, with chi-square p-value=0.000. No other significant association was recorded between outcome variables and patient age. Surgical site infection was more frequent among male patients (n=25, 53.2%) compared to females (n=22, 46.8%), p-value=0.010. The difference in distribution of other outcome variables with respect to gender was statistically insignificant, as shown in table 4.

Table 4: Stratification of Postoperative Outcomes with Respect to Patient Age and Gender(n=149)

Postoperative Outcomes		Age (Years)		Total	p-value
		40 or Below	Above 40		
Surgical Site Infection	Yes	35 (74.5%)	12 (25.5%)	47 (100.0%)	0.625
	No	72 (70.6%)	30 (29.4%)	102 (100.0%)	
Wound Dehiscence	Yes	11 (52.4%)	10 (47.6%)	21 (100.0%)	0.033
	No	96 (75.0%)	32 (25.0%)	128 (100.0%)	
Intestinal Obstruction	Yes	19 (63.3%)	11 (36.7%)	30 (100.0%)	0.248
	No	88 (73.9%)	31 (26.1%)	119 (100.0%)	
Hospital Stay (Days)	7 or below	80 (87.0%)	12 (13.0%)	92 (100.0%)	0.000
	Above 7	27 (47.4%)	30 (52.6%)	57 (100.0%)	
Postoperative Outcomes		**Gender**		**Total**	**p-value**
		Male	**Female**		
Surgical Site Infection	Yes	25 (53.2%)	22 (46.8%)	47 (100.0%)	0.010
	No	76 (74.5%)	26 (25.5%)	102 (100.0%)	
Wound Dehiscence	Yes	14 (66.7%)	7 (33.3%)	21 (100.0%)	0.906
	No	87 (68.0%)	41 (32.0%)	128 (100.0%)	
Intestinal Obstruction	Yes	18 (60.0%)	12 (40.0%)	30 (100.0%)	0.307
	No	83 (69.7%)	36 (30.3)	119 (100.0%)	
Hospital Stay (Days)	7 or below	59 (64.1%)	33 (35.9%)	92 (100.0%)	0.225
	Above 7	42 (73.7%)	15 (26.3%)	57 (100.0%)	

The association between the amount of intra-abdominal collection and postoperative outcomes was statistically not significant (p-value>0.05) as shown in table 5.

Table 5: Stratification of Outcome Variable with Respect to Intra-Abdominal Collection(n=149)

Postoperative Outcomes		Collection		Total	p-value
		>150ml	<150ml		
Surgical Site Infection	Yes	19 (40.4%)	28 (59.6%)	47 (100.0%)	0.888
	No	40 (39.2%)	62 (60.8%)	102 (100.0%)	
Wound Dehiscence	Yes	10 (47.6%)	11 (52.4%)	21 (100.0%)	0.417
	No	49 (38.3%)	79 (61.7%)	128 (100.0%)	
Intestinal Obstruction	Yes	14 (46.7%)	16 (53.3%)	30 (100.0%)	0.376
	No	45 (37.8%)	74 (62.2%)	119 (100.0%)	
Hospital Stay (Days)	7 or below	36 (39.1%)	56 (60.9%)	92 (100.0%)	0.882
	Above 7	23 (40.4%)	34 (59.6%)	57 (100.0%)	

DISCUSSIONS

In the circumstance of perforated appendicitis, late presentation with concurrent medical conditions is an important contributor to additional disability [11]. Acute appendicitis remains the most prevalent surgical emergency. Whenever acute appendicitis advances to perforation, its implications can be fatal or lead to a long and challenging recovery [12]. According to the results, patients under the age of forty years were the most likely to have presented with perforated appendicitis; the mean age of these patients was 33.91 ± 11.834 years. These results were consistent with other studies where patients in the third decade of life were the most prevalent age group [7, 8]. Moreover, the complication rate was higher among male

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patients in our study cohort. The male predominance is indicated by results with a male-to-female ratio of 2.1 to 1, which is consistent with other studies' results [5, 13]. Surgical site infection accounted for the most frequent postoperative complication, which was followed by wound dehiscence, intestinal obstruction, and prolonged hospital stay. Prolonged hospital stay was frequently recorded among patients aged more than 40 years [14]. According to the results, the average time between the onset of pain and hospital presentation was 34.35 ± 4.897 hours, showing a delayed presentation to hospital, i.e., after 24 hours of onset of pain. Patients who presented late had a higher morbidity rate than those who presented early. Patients with preexisting concurrent diseases who were presented late were the only ones who experienced more complications. These results are consistent with research [14, 15]. Therefore, one important factor affecting outcomes following surgery is the delay in undergoing surgery for appendicitis with perforation in patients who arrive at the emergency room late. According to study results, peritoneal collection of more than 150 ml was recorded in 59 (39.6%) patients. These findings were comparable to those of Afenigus AD and colleagues [7]. For patients with moderate to severe peritoneal collections, the corresponding rates of complications increase. Among patients with extensive peritoneal contamination, the death ratio was high; however, no mortality was recorded in our study. Severe intraperitoneal accumulation is therefore linked to a greater perioperative death and disability rate. Retrocaecal and pelvic were the most often reported positions for perforated appendicitis. This result is consistent with the observations of other studies [16, 17]. Another potential factor for increased complication rate was the position of the appendix. Retrocaecal location is most frequently linked to appendicular perforation and peritonitis because it frequently presents an identification challenge, both physically and on imaging, delaying diagnosis [18]. In the majority of instances, the surgical technique was an appendectomy followed by right hemicolectomy following appendix root perforation. No fecal fistula was recorded; hence, cecal resection with primary anastomosis or ileostomy was not performed. The procedure was reported on one patient who had undergone an appendicectomy originally but developed a fecal fistula in a study by Potey *et al.* [10]. The procedure was further complicated by a surgical site infection that was treated with antibiotics and daily dressings. Patients with an appendix base perforation had the greatest rates of morbidity and complications among all patients [19]. These results were consistent with those of Afenigus AD *et al.* [7]. The method used to treat perforated appendicitis is not mentioned in another research [20].

CONCLUSIONS

A significant proportion of patients with perforated appendicitis suffered postoperative complications in the form of surgical site infection, prolonged hospital stays, and wound dehiscence. Postoperative complications were more common among male patients aged more than 40 years. Late hospital presentation was a contributing element to appendicular perforation and its unfavorable consequences.

Authors Contribution

Conceptualization: R
Methodology: R, SA[1], KN, MBUD, IA
Formal analysis: MBUD, IA, SA[2]
Writing review and editing: R, SA[1], KN, SA[2]

All authors have read and agreed to the published version of the manuscript

Conflicts of Interest

All the authors declare no conflict of interest.

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