# Pattern of Clinical Presentation, Risk Factors and Outcome of Patients with Perforated Appendicitis

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*ABSTRACT*

*Objective* — *To determine the mode of presentation of patients with perforated appendicitis, the risk factors and outcome after emergency appendectomy.*

*Study design* — *Cross sectional study..*

*Place & Duration of study* — *Department of Surgery Ward 2, Jinnah Postgraduate Medical Center (JPMC) Karachi, from March 2022 to March 2023.*

*Methods* — *All patients who presented with signs and symptoms of acute appendicitis were included. Clinical presentation, the risk factors and operative findings were noted. The histopathology reports were analyzed for confirming the diagnosis of acute appendicitis. Data were entered into SPSS version 20. Quantitative data were presented as mean and standard deviations and qualitative data were reported in frequencies and percentages. Post stratification Chi square test / Fischer test was applied. A p value <0.05 was taken as significant.*

*Results* — *A total of 126 patients had appendectomy for acute appendicitis. There were 67 (53.17%) male and 59 (46.83%) female patients. The age was between 29 years to 70 years, with the mean age of 47.14±16.49 years. Twenty-two (17.5%) patients had perforated appendicitis. Mean duration of surgery was 2.72±1.58 hours and hospital stay 4.72±3.24 days. The mean BMI was 27.41±2.56 kg/m$^2$. Post stratification data analysis showed that age (p=0.01) and anemia (p=0.01) had statistically significant association with perforated appendicitis while other variables like gender, patient delay, in-hospital delay and comorbid conditions had no significant relationship.*

*Conclusion* — *Perforation of appendix was more often reported in younger age group and in those with preexisting anemia.*

*Key words* — *Perforated appendicitis, Acute appendicitis, Emergency appendectomy, Risk factors.*

**INTRODUCTION:**

Acute appendicitis is one of the most commonly encountered surgical emergencies. When surgery is delayed the chances of perforation increases. It may also lead to appendicular abscess or lump formation. Thus, early diagnosis and surgical intervention may prevent the complications of acute appendicitis. In case of obstruction to the lumen of appendix transmural necrosis occurs quickly. This may result from a fecolith or foreign body like seeds of fruits, vegetables, intestinal worms and due to other pathologies.[1]

The diagnosis of appendicitis is usually clinical. However, ultrasound may further validate it. CT scan

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abdomen may be helpful in doubtful cases. Laboratory investigations like complete blood picture and differential count along-with C-reactive protein facilitate the decision making.[2] In spite of all the measures late presentation of the patient is often noted in whom complications already set-in. The appendicular perforation is the most important of all.[3,4] In one of the studies the perforation rate of 9% is reported.[5]

In clinical setting of a tertiary care hospital, patients are referred quite late, who most often have other co morbid condition. The risk of complications is thus increased. This study was conducted to specifically target patients with perforated appendix and document the clinical presentation, the associated risk factors and outcome. This study adds to evidence-based data for the management of patients with acute appendicitis.

## METHODS:

**Study design, place and duration:** This cross-sectional study was conducted in the Department of General Surgery Ward 2, Jinnah Postgraduate Medical Center Karachi, from March 2022 to March 2023.

**Ethical considerations:** The study was approved by the Ethical Review Committee (F.2-81/2022 dated 01.04.2022). Written informed consent was taken from the patients.

**Sample size estimation:** WHO calculator was used to calculate sample size which was determined by taking the prevalence of perforated appendicitis (9%),[6] the margin of error (5%), and the confidence level (Cl - 95%). The sample size was estimated to be 126.

**Inclusion / Exclusion criteria:** All patients between 20 years to 70 years of age, of either gender, who presented with acute appendicitis and underwent emergency appendectomy were included. Patients with acute abdominal pain who on investigations were found to have other pathological conditions and those with appendicular lump at presentation were excluded. Non-probability consecutive sampling technique was used for patient selection.

**Study protocol:** Detailed history was taken and examination done. Weight and height were measured in kilogram and meters respectively. BMI was calculated at the time of admission. General health related variables like diagnosis of diabetes mellitus during the last six months, use of anti-diabetic drugs, presence of hypertension and use of anti-hypertensive agents were recorded. Anemia was labeled when hemoglobin was less than 12mg/dl in males and 11mg/dl in females. Status of smoking (more than 10 cigarettes per day for the last two years) and presence of obesity (BMI of more than 25 kg/m$^2$) were recorded.

Emergency appendectomy was done in all cases. Operative findings were recorded on a pre designed form. Patients were diagnosed as having perforated appendicitis on the basis of full thickness defect in the appendicular wall or abscess formation. Histopathology reports were traced for final diagnosis of acute appendicitis. Length of hospital stay and duration of surgery were also noted. Time between onset of symptoms and reporting at our hospital was also recorded.

**Statistical analysis:** SPSS Version 20 was used for data analysis. Quantitative data were presented as mean and standard deviations for age, height, weight, BMI, hospital stay and duration of surgery. Median (IQR) was used for the skewed data. Qualitative data like gender, presence of diabetes mellitus, hypertension, smoking status, were reported in frequencies and percentages. Post stratification Chi square test / Fischer test was applied. A p value <0.05 was taken as significant.

## RESULTS:

Total of 126 patients of acute appendicitis were included. There were 67 (53.17%) male 59 (46.83%) female patients. Age of the patients was between 29 years to 70 years There were 44 (34.92%) patients between 20 years to 45 years and 82 (65.08%) between 46 years - 70 years. Mean age was 47.14±16.49 years. Analysis of demographic data showed mean BMI 27.41±2.56 kg/m2, height 158±7.28 cm and weight 78.7±9.87 kg. In 43 (34.1%) patients the duration of the surgery was < 2 hours and in 83 (65.87%) was >2hours with mean duration of 2.72±1.58 hours. The hospital stay in 57 (45.24%) patients was < 7 days with the mean of 4.72±3.24 days.

A total of 22 (17.5%) patients had perforated appendicitis. Majority of these were between 20 years - 45 years (p=0.01). The male to female ratio was 1:1 (p=0.74). Post stratification for perforated appendicitis the duration of surgery was < 2 hours in 7 and > 2 hours in fifteen patients (p=0.80). Hospital stay for < 7 days was noted in 13 (22.8%) with and 44 (77.2%) without perforated appendicitis and of > 7 days in 9 (13%) of perforated and 60 (87%) of non-perforated appendicitis (p=0.15).

**Table I: Risk Factors For Perforated Appendicitis in Patients With Acute Appendix (n= 22 / 126)**

| Risk Factors | Number of Perforated Appendix (n %) | Number of Non-Perforated Appendix (n %) | p-value |
|---|---|---|---|
| Hospital Delay< 8 Hours (n=65) | 11 (16.9%) | 54 (83.1%) | 0.87 |
| Hospital Delay>8 Hours (n=61) | 11 (18%) | 50 (82%) | |
| Patient Delay<8 Hours (n=62) | 13 ( 21%) | 49 (79%) | 0.30 |
| Patient Delay>8 Hours (n=64) | 9 (14.1%) | 55 (85.9%) | |
| Smoking (n=62) | 8 (12.9%) | 54 (87.1%) | 0.18 |
| Hypertension (n=42) | 5 (11.9%) | 37 (88.1%) | 0.24 |
| Diabetes Mellitus (n=18) | 1 (5.6 %) | 17 (94.4%) | 0.15 |
| Obesity (n=48) | 7 (14.6%) | 41 (85.4%) | 0.50 |
| Anemia (n=47) | 14 (29.8%) | 33 (70.2%) | 0.01* |

Details related to other variables is given in table I.

**DISCUSSION:**

The frequency of perforated appendicitis in this study was 17.5%. Acute appendicitis is one of the most common surgical emergencies in surgical practices. However, the diagnosis is often missed or a delay occurs that results in progress of the disease and results in complications. Perforation of appendix is one of such sequelae. The peak age of patient with perforated appendix between 21 years to 30 years with male predominance as reported in a study.[3] The perforation of appendix was reported 28.5%. In our study males were predominantly involved and mean age of the patients was 47±16.4 years. The frequency of perforation was less than other study.

Our study also analyzed the risk factors. In literature patient related delay time of more than 12-hours was reported as a cause perforation of appendix.[7] In our study this factor was statistically insignificant. The perforation may result due to delay in making diagnosis which can occur in up to 20% patients.[8] Alvarado scoring system may help the referring doctors in making a diagnosis of acute appendicitis as it has 94% sensitivity.[9] Perforation of appendix can also be avoided if patient delay time is reduced. The in-hospital delay is also considered a risk factor of perforation. In our study perforation rate was less as hospital delay was minimum. However, it was statistically insignificant.

Negative appendectomy may also lead to complication. It more common in female where an incidence of 20% - 25% is reported.[10] Laboratory investigations can help in identifying patients with acute appendicitis. In our study 96% patients showed high total leucocyte count. Appendix is likely to be perforated in those patients with a leucocyte count of more than 13000 $mm^3$. Liver function test are also deranged in all patients with perforated appendix.[11] High C-reactive proteins level, a commonly available test, also indicate acute appendicitis though it is not specific.[12] Presence of diabetes mellitus and hypertension as co morbid were also analyzed in patients with acute appendicitis in our study. However, both the variables were not found significant in relation to perforated appendix on post-stratification.

**Limatations of the study**: This is a cross sectional study from a single tertiary care hospital. A multicenter study may be conducted to provide more data specially in context of delay in diagnosis, factors related to it and perforation rate in those patients.

**CONCLUSION:**

Perforation of appendix occurred in large number patients. A delay in diagnosis and referral to proper medical facility where treatment is provided can help in reducing the rate of perforated appendix which was more commonly encountered in males of relatively younger age group.

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Received for publication: 21-06-2023

Sent for revision: 25-08-2023

Accepted after revision: 04-09-2023

Author's Contributions:
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Disclosure: This is a dissertation based study of Dr. Ainnan Memon.

Source of funding: No funding was received.

Competing interest: None declared

Ethics considerations: ERC approval was taken and informed consent obtained from patients.

How to cite this article:
Memon A, Iqbal M, Zahid A, Afaque A, Khan MN, Kumar D. Pattern of clinical presentation, risk factors and outcome of patients with perforated appendicitis. J Surg Pakistan. 2023;28 (2):43-6.