

# Hyperbilirubinemia as a diagnostic factor for diagnosing appendicular perforation.

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## I. Introduction:

Appendicitis is the most typical cause of an acute abdomen. Clinical history and physical examination are used to make the diagnosis of acute appendicitis. Abdominal ultrasonography is frequently used to diagnose appendicitis. To reach the diagnosis, numerous grading systems were devised. These rating scales are based on clinical characteristics and lab tests. Alvarado, Modified Alvarado, and RIPASA are a few examples. There is still no conclusive laboratory test for the diagnosis of appendicular perforation. Few studies have shown that appendicular perforation is associated with elevated serum bilirubin, but their significance has not been emphasized. The current study aims to evaluate the link between bilirubin levels and its validity as a predictive marker for the diagnosis of appendicular perforation in light of the aforementioned context.

## II. Aims and Objectives:

### Aim:

To study the role of bilirubin levels as a predictor for appendicular perforation.

### Objective:

1. To assess the role of bilirubin levels in acute appendicitis.
2. To assess the role of elevated bilirubin levels in the prediction of appendicular perforation.

### Methodology:

This is a prospective observational study conducted on 100 patients diagnosed with acute appendicitis on abdominal ultrasonography, attending to MGM hospital, Warangal.

### Inclusion criteria:

1. All patients who were diagnosed clinically as having acute appendicitis at arrival.
2. Age group 10-70 years old.
3. Only individuals with histopathological reports suggesting acute appendicitis or appendicular perforation were included.

### Exclusion criteria:

1. All patients who have liver illness or jaundice in their medical records-
  - chronic alcoholism (defined as using more than 20 g of alcohol per day for women and more than 40 g per day for men)
  - Hemolytic illness
  - Congenital or acquired biliary illness.
2. Hepatitis
3. Cholelithiasis
4. Hepato-biliary system malignancy.

The patients undergoing surgery for acute appendicitis were evaluated for the level of serum bilirubin and final histopathological report will be considered as the final diagnosis. The serum bilirubin levels were compared to the final histopathological report. Data were analysed using Microsoft excel. Categorical data was represented in the form of mean. The study abides by the guidelines laid by the declaration of Helsinki.

## III. Results:

A total of 100 patients were enrolled in the study. The mean age of the study population was  $29.5 \pm 2.2$  years. Most common age group was 11-20. 32% were females and 68% were males. The mean duration of symptoms was  $1.38 \pm 0.5$  days. The mean total bilirubin value was  $1.1 \pm 0.3$  mg/dl and the mean direct bilirubin value was  $0.38 \pm 0.2$  mg/dl. Total bilirubin was elevated above 1mg/dl in 35 patients. Out of the 100 patients,

24 patients were diagnosed with appendicular perforation on histopathological examination. The division of patients with appendicular perforation with elevated and normal bilirubin is shown in the table no. 1.

**Table no.1-**

Total bilirubin	No. of patients with appendicular perforation	Percentage
≤ 1.0 mg/dl	7	29.16
>1.0 mg/dl	17	70.84
Total	24	

**Table (2)** showing the comparison of total bilirubin value with final histopathological diagnosis-

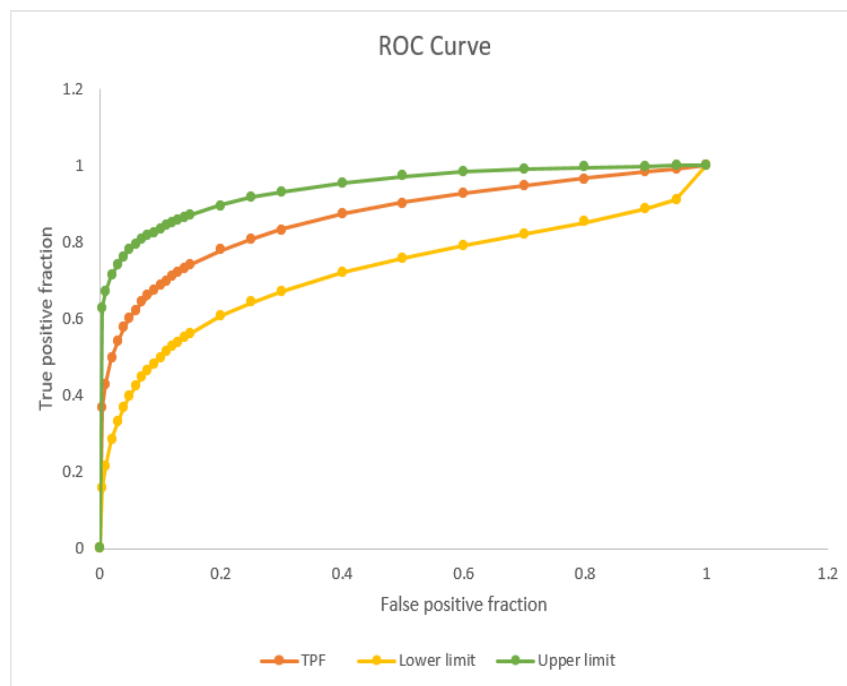
**Table no.2-**

Total bilirubin	No of patients with appendicular perforation	No. of patients with acute appendicitis
>1.0 mg/dl	17	8
≤ 1.0 mg/dl	7	68
Total	24	76

The data is significant with  $p$  value < 0.05, proving that elevated bilirubin is more in appendicular perforation than acute appendicitis.

This is an ROC curve showing the effectiveness of total bilirubin in diagnosing appendicular perforation.

**Figure no 1-**



The Area under curve (Az) = 0.86, Estimated standard error = 0.04, Sensitivity is 66.66%, Specificity is 87.2%, Positive predictive value is 62.5%, Negative Predictive value is 90%, Odds ratio=13.2.

#### IV. Discussion:

The most frequent cause of abdominal emergency in young adults is acute appendicitis<sup>1</sup>. It comprises almost 1% of all surgical operations. Infants rarely experience it, and as children get older, their chances of experiencing it rise. Patients in their second through fourth decades of life have the highest incidence. Continuous secretion of mucinous fluid from the blocked viscus is thought to generate an intraluminal pressure rise that eventually results in the collapse of the draining veins. The blood supply is further embarrassed by ischemic injury, which subsequently encourages bacterial growth with more inflammatory edoema and exudation. Even still, a sizable portion of inflamed appendices lack a clearly visible luminal blockage, and the cause of the inflammation is still unknown. In the early stages, the mucosa, submucosa, and muscularispropria may only contain a little amount of neutrophilic exudate. Congested subserosal arteries frequently have a mild perivascular neutrophil infiltration. The operating surgeon can identify early acute appendicitis from the

inflammation's alteration of the normally sparkling serosa into a drab, grainy, red membrane<sup>2</sup>. Abscesses emerge inside the wall as the inflammatory process intensifies, and the mucosa also develops ulcerations and foci of suppurative necrosis. Acute suppurative appendicitis is what this condition entails. Further vascular compromise causes acute gangrenous appendicitis, which is immediately followed by rupture and suppurative peritonitis<sup>3</sup>. Increased bilirubin levels in the blood are known as hyperbilirubinemia. It might be caused by a problem with bilirubin metabolism and elimination or by an increase in bilirubin production. As a laboratory marker for perforated or gangrenous appendix, it is not widely accepted. Both of the aforementioned methods cause an increase in bilirubin production and a decrease in bilirubin clearance, which causes a buildup of bilirubin as seen in gangrenous and perforated appendicitis. Numerous types of bacterial infections have been shown to coexist with hepatic abnormalities in the production and flow of bile acid. Hyperbilirubinemia, a well-known side effect of severe bacterial infection, will ultimately result from this, primarily in septic patients. Proinflammatory cytokines and nitric oxide are produced by septic patients who have extra hepatic bacterial infections, such as gangrenous appendices and perforated appendices<sup>4</sup>.

Thangadurai et al.<sup>5</sup> have conducted a study on the diagnostic value of hyperbilirubinaemia as a predictive factor for appendicular perforation in 2018. The study included 378 individuals who had been hospitalised to the emergency surgery unit and had symptoms of acute appendicitis or appendicular perforation. On admission, all individuals who had been clinically diagnosed with acute appendicitis or appendicular perforations were included. Only patients who underwent surgery (both open and laparoscopic), whose intraoperative findings were documented, followed up on after surgery, and confirmed by histological assessment suggestive of appendicitis were included in both of these groups. Out of the 378 study participants, 207 were men and 171 were women, or 55% men and 45% women. 82% of the 378 participants in the research had acute appendicitis, and 18% had an appendicular perforation. The majority of the study participants were aged between 15 and 35. The mean bilirubin levels in acute appendicitis are 0.97 mg% and 1.63 mg%, respectively, and the difference between the two is shown to be statistically significant with a p-value of 0.001. After surgery, bilirubin and alkaline phosphatase return to normal after 48 and 72 hours (in cases of perforation) and 24 and 48 hours, respectively (non-perforated cases). With a 0.9 mg% cutoff point, hyperbilirubinemia has a sensitivity of 89.6%, specificity of 71.4%, positive predictive value of 27%, and negative predictive value of 96.9% for appendicitis patients.

Murat et al.<sup>6</sup> have published a study on the relationship between perforated appendix and the total and direct bilirubin in 2019. According to the TB in Group 1 and the DB in Group 2, perforated appendicitis (PA) and non-perforated appendicitis (NPA) were studied. 269 patients in Group 1 had their pre-operative TB levels tested. The average age of the patients, 148 (55%) men and 121 (45%) women, was 28 years. 218 (81%) of those patients had NPA, while 51 (19%) had PA. In 10 (20%) of 51 patients with PA and 31 (14%) of 218 patients with NPA, the prevalence of TB was high, respectively. TB was 1.37 times more prevalent in PA patients than NPA patients (p 0.01). The TB demonstrated 20% sensitivity, 14% specificity, 24% positive predictive value, and 18% negative predictive value in patients with PA. In Group 2, 258 patients' DB were measured prior to surgery. The patients' average age was 28.7 years, with 144 (56%) men and 114 (44%) women among them. 208 (81%) of those patients had NPA, while 50 (19%) had PA. Seven (14%) of the 50 patients with PA and 17 (8.17%) of the 208 patients with NPA had high levels of DB, respectively. In patients with PA compared to those with NPA, DB was 1.71 times higher (p< 0.001). DB demonstrated 14% sensitivity, 8% specificity, 29% positive predictive value, and 18% negative predictive value. The results in our study was similar to the results obtained in these studies.

## V. Conclusion:

- Serum total bilirubin is elevated in appendicular perforation than in acute appendicitis and is statistically significant.
- Serum total bilirubin has a Sensitivity of 66.66%, a Specificity of 87.2%, and a Positive predictive value (PPV) of 62.5% in detecting appendicular perforation.

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