

# Role of Serum Bilirubin as a Marker of Acute and Complicated Appendicitis

Pankaj Garg<sup>1</sup>, Garima Sharma<sup>2</sup>, Ravinder Pal Singh<sup>3</sup>

<sup>1</sup>Ex Resident, Department of Surgery, DMCH, Medical College and Hospital Ludhiana, <sup>2</sup>Associate Professor, Department of Physiology, DMCH, Medical College and Hospital Ludhiana, <sup>3</sup>Professor, Department of Surgery, DMCH, Medical College and Hospital Ludhiana.

## Abstract

**Background:** Acute appendicitis is the most common surgical emergency and early surgical intervention is seen to improve outcomes. Jaundice has been associated with appendicitis and studies have shown hyperbilirubinemia to be a useful predictor of appendiceal perforation. Elevated serum bilirubin will help in early and accurate diagnosis of acute appendicitis. This study aims to evaluate the role of serum bilirubin as a marker in acute appendicitis. **Subjects and Methods:** This study was conducted in the department of surgery, Dayanand medical college and hospital, Ludhiana on patients of acute appendicitis. Routine investigations including bilirubin total and bilirubin direct were done and the mean value of bilirubin total and liver enzymes in cases of acute appendicitis was calculated. The p value <0.05 was considered significant. **Results:** The mean age of the patients was 27.29±16.4 years. There were a total of 59 patients with 47 males and 12 females. The total bilirubin levels in cases with acute appendicitis and complicated appendicitis were 0.71±0.29 and 1.46±0.66 respectively. **Conclusion:** Increase in serum bilirubin levels were seen in patients of complicated appendicitis and it can be added in the list of routine investigations at the time of admission in suspected cases of appendicitis.

**Keywords:** Appendicitis, Bilirubin, Diagnosis.

**Corresponding Author:** Dr. Garima Sharma, Associate Professor, Department of Physiology, DMCH, Medical College and Hospital Ludhiana.

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## Introduction

Acute appendicitis is the most common surgical emergency and early surgical intervention improves outcomes.<sup>[1]</sup> Approximately 8% of people in the world have had appendicitis at some point of their life with peak incidence between 10-30 years of age. The diagnosis of acute appendicitis is made from the history and clinical examination with the help of laboratory investigations and the role of imaging is still secondary. Despite its high frequency, it still remains elusive in its diagnosis and mimics other abdominal pathologies. Diagnosis becomes more difficult in extremes of ages and females in reproductive age group in which because of a high incidence of genitourinary and gynaecological conditions which present with similar signs and symptoms as of acute appendicitis. A delay in performing an appendicectomy increases the risk of appendiceal perforation and sepsis, which in turn increases morbidity and mortality.<sup>[2-4]</sup> Although radiological studies like contrast enhanced computed tomography (CECT) are highly sensitive and specific for diagnosis and confirmation of appendiceal perforation, but they are not available to 1/3 rd of world population and emergency units of developing world. So

they have to rely on hematological investigations like WBC count, CRP etc which are non-specific. Lab evaluation of serum bilirubin allows detection in two forms: indirect or unconjugated and direct or conjugated.<sup>[5]</sup> Jaundice has been associated with appendicitis and studies have shown hyperbilirubinemia to be a useful predictor of appendiceal perforation. A simple cheap biochemical test that is specific for acute appendicitis may be useful in conjunction with clinical findings in deciding which patients are likely to have appendicitis and should be considered for surgery. Elevated serum bilirubin level will help in early and accurate diagnosis of acute appendicitis and in predicting its serious complications, most importantly perforation.<sup>[6-8]</sup> This study aims to evaluate the role of serum bilirubin as a marker in acute appendicitis.

## Subjects and Methods

This study was conducted in the department of surgery at Dayanand medical college and hospital, Ludhiana on patients with acute appendicitis after taking an informed consent. Particulars of each patient were noted including name, age, sex, occupation, admission number, occupation and address for future correspondence. A written informed

consent was taken from all the patients. Detailed history of each patient was obtained including history of presenting symptoms, any pre-existing co-morbid conditions and the patient's background history. These patients underwent routine investigations including total and direct bilirubin along with Liver enzymes SGOT, SGPT and ALT. The Serum Bilirubin and liver enzymes were assessed using the auto analyzer machine available in the Hospital. The results were grouped as normal or raised as per the reference levels. Statistical analysis was performed using chi square test and fisher's exact test to compare bilirubin and liver enzymes for acute and complicated appendicitis. Data was described in terms of range; mean  $\pm$  standard deviation ( $\pm$  SD). A probability value (p value < 0.05) was considered significant.

### Results

There were a total of 59 patients with 47(79.7%) males and 12(20.3%) females. The mean age of the patients was 27.29  $\pm$  16.4 years. The maximum patients with acute appendicitis were in the age group of 11-20 years (32.2%). Table I illustrates the levels of bilirubin in patients with acute appendicitis. The number of patients with acute appendicitis who had normal bilirubin levels were 37 (62.7%) and number of patients with raised bilirubin levels were 22(37.3%). Table II shows the Bilirubin levels in acute and complicated appendicitis. out of 39 patients with acute appendicitis only 7 were found to have raised bilirubin whereas out of 20 patients with complicated appendicitis 15 were found to have raised bilirubin (which was statistically significant p value < 0.05)

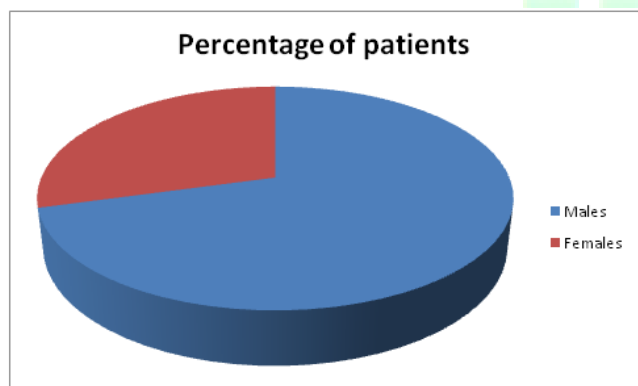


Figure 1: Distribution of subjects

Table 1: Bilirubin levels in appendicitis patients

| Biopsy group            | Bilirubin levels |        | Total | Chi-square value | p- value |
|-------------------------|------------------|--------|-------|------------------|----------|
|                         | Normal           | Raised |       |                  |          |
| Acute appendicitis      | 32               | 7      | 39    | 19.345           | 0.00     |
| Gangrenous appendicitis | 0                | 3      | 3     |                  |          |
| Perforated appendicitis | 5                | 12     | 17    |                  |          |
| Total                   | 37               | 22     | 56    |                  |          |

Table 2: Bilirubin levels in acute and complicated appendicitis patients

| Biopsy group             | Bilirubin levels |        | Total | Chi-square value | p- value |
|--------------------------|------------------|--------|-------|------------------|----------|
|                          | Normal           | Raised |       |                  |          |
| Acute appendicitis       | 32               | 7      | 39    | 18.401           | 0.00     |
| Complicated appendicitis | 5                | 15     | 20    |                  |          |
| Total                    | 37               | 22     | 59    |                  |          |

### Discussion

Appendicitis is one of the commonest causes of abdominal pain requiring emergency surgery. Different clinical signs and symptoms always mimic the diagnosis of acute appendicitis with number of causes leading to pain in right iliac fossa, especially in females. To decrease the morbidity and mortality of perforated appendix, a preoperative diagnosis of perforation should be sought at earliest.<sup>[6,7]</sup> To prevent the catastrophic effects of perforated appendix, a surgeon needs diagnostic tools which may signal perforation of appendix at earliest, as a result of which the delay in the management of perforated appendix will not be witnessed. One newer diagnostic tool added to the spectrum is hyperbilirubinemia, as elevated total serum bilirubin has been seen to signal perforation. Hyperbilirubinemia in patients with appendicitis may have a predictive potential for preoperative diagnosis of appendiceal perforation.<sup>[8]</sup> Hence; the present study was undertaken for assessing the role of serum bilirubin as a marker in acute appendicitis.

In the present study, there were a total of 59 patients with 47(79.7%) males and 12(20.3%) females. The mean age of the patients was 27.29  $\pm$  16.4 years. The maximum patients with acute appendicitis were in the age group of 11-20 years (32.2%). Emmanuel A et al studied a total of 472 patients whose age ranged from 5 years to 82 years with a mean age of 27 years, which correlates with this study. Acute appendicitis was more prevalent in the age group of second to third decade and males outnumbered females as was also seen in study by Khan S.<sup>[1,10]</sup>

The number of patients with acute appendicitis who had normal bilirubin levels were 37 (62.7%) and number of patients with raised bilirubin levels were 22(37.3%). Table II shows the Bilirubin levels in acute and complicated appendicitis. Out of 39 patients with acute appendicitis only 7 were found to have raised bilirubin whereas out of 20 patients with complicated appendicitis 15 were found to have raised bilirubin. Present results were consistent with the study conducted by Sand M et al. They found that the mean bilirubin levels of all patients were 0.9mg/dl ( $\pm$ 0.65 SD mg/dl), range 0.1-4.3mg/dl, and median 0.7mg/dl. Patients with appendiceal perforation however had a mean bilirubin level of 1.5mg/dl ( $\pm$ 0.9 SD mg/dl.), range 0.4-4.3, median 1.4mg/dl, which was significantly higher than those with a non-perforated appendicitis (P<0.05).<sup>[11]</sup> Present results are comparable with study conducted by Emmanuel et al (2011), they found in their study that the patients with a gangrenous and perforated appendicitis had higher mean

bilirubin levels than those with simple acute appendicitis ( $p=0.01$ ). Atahan K et al and Ghimire P et al also found in their studies that the mean bilirubin levels of patients with complicated appendicitis were higher than those with simple acute appendicitis ( $P<0.001$ ).<sup>[10,12,13]</sup>

In recent years, studies have emerged to show that serum bilirubin levels could indicate patients with acute appendicitis. Some studies have also formulated that hyperbilirubinemia can be associated with perforation and severity of the appendicitis. Elevated serum bilirubin levels can be explained by the invasion of the Gram-negative bacteria to the appendix, leading to direct invasion or translocation of the germs in the portal system and the liver, interfering with bilirubin excretion through bile ducts by endotoxin action. So these markers, along with clinical presentation, can be used to improve preoperative diagnosis of acute appendicitis as well as prediction of its rupture as a new severity marker.<sup>[14-16]</sup>

## Conclusion

From the above results, the authors conclude that increase in serum bilirubin levels were seen in patients of complicated appendicitis and it can be added in the list of routine investigations at the time of admission in suspected cases of appendicitis.

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