

Study to Identify Role of Preoperative Bilirubin Level in Predicting the Severity of Acute Appendicitis

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Abstract

Aim: The aim of the present study was to identify whether preoperative bilirubin level can predict the severity of the disease.

Material & Methods: The study was conducted in the Department of General Surgery, Himalayan Institute of Medical Sciences, Dehradun, India for Eight months on 100 consecutive patients who were clinically diagnosed as acute appendicitis. These patients were evaluated with Alvarado score. In addition, preoperative bilirubin level and liver enzymes were estimated. Ultrasound abdomen was done preoperatively routinely. After surgery histopathology was studied. The parameters which showed statistically significant results for predicting complications were analyzed.

Results: In the conducted investigation, the gender distribution revealed that 62 individuals (62%) identified as men, whereas 38 individuals (38%) identified as girls. Among the total of 100 instances, 45 were deemed to be complex in nature. Out of a total of 100 patients, 60 exhibited high levels of bilirubin whereas the other 40 instances had normal bilirubin levels. Among a sample size of 100 cases, it was observed that 40 patients had a total leucocyte count above 11000.

Conclusion: Patients diagnosed with appendicitis who have increased levels of bilirubin are at a heightened risk for experiencing complications such as perforation, gangrene, and suppuration.

Keywords: Acute appendicitis, Gangrenous appendix, Hyperbilirubinemia, Perforated appendix.

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Introduction

Acute appendicitis is a prevalent abdominal emergency necessitating immediate surgical intervention, with appendectomy being the most often performed emergency procedure on a global scale. [1,2] There have been many proposed scoring systems, including the Alvarado score, for the diagnosis of appendicitis. These scoring systems rely on a combination of clinical symptoms, physical examination findings, and laboratory data. [3] Nevertheless, the conventional indications and manifestations of appendicitis may sometimes be lacking, hence posing challenges in establishing a definitive diagnosis. [4] In light of the fact that the delayed identification and management of severe appendicitis is linked to heightened probabilities of perforation, postoperative complications, mortality, and prolonged hospitalization, there exists a pressing want for a prognostic tool capable of assessing the

severity of acute appendicitis. [5] The presence of hyperbilirubinemia, unrelated to liver failure or biliary blockage, has been documented in instances of acute appendicitis. [6-10] While many studies have examined the use of hyperbilirubinemia in evaluating acute appendicitis, its clinical significance continues to be a topic of debate.

The significance of laboratory studies, such as white blood cell (WBC) counts and C-reactive protein (CRP) levels, has been emphasized as a means to complement clinical diagnosis and minimize the occurrence of needless appendectomies. [11] The use of ultrasonography (USG) as a diagnostic modality for appendicitis has been extensively recognized and investigated. [12] Diagnostic scores that integrate clinical symptoms and laboratory tests have been created and demonstrate sufficient accuracy in reaching a diagnosis. Two scoring methods that are often used

are the Alvarado score and the Modified Alvarado score. [3,13] The significance of elevated total bilirubin levels in the context of acute appendicitis and appendicular perforation has not been adequately emphasized. The invasion of bacteria in the appendix results in the transmigration of bacteria and the subsequent release of pro-inflammatory cytokines, including TNF-alpha and IL-6. These cytokines are then transported to the liver through the portal system, potentially causing inflammation, abscess formation, or liver dysfunction. This can occur either directly or indirectly by modifying the flow of blood in the hepatic system. [14,15]

Consequently, our study sought to examine the clinical relevance of preoperative hyperbilirubinemia and evaluate its potential as a prognostic indicator for the severity of acute appendicitis.

Material & Methods

The study was conducted in the Department of General Surgery, Himalayan Institute of Medical Sciences, Dehradun, India for eight months on 100 consecutive patients who were clinically diagnosed as acute appendicitis. These patients were evaluated with Alvarado score. In addition, preoperative bilirubin level and liver enzymes were estimated. Ultrasound abdomen was done preoperatively routinely. After surgery histopathology was studied. The parameters which showed statistically significant results for predicting complications were analyzed.

Inclusion Criteria: All patients who were diagnosed to have appendicitis and admitted in surgery department and who underwent appendectomy were included in the study.

Exclusion Criteria: Appendectomy performed incidentally, patients with appendicular lump, history of alcoholic liver disease, hemolytic or liver diseases associated with hyperbilirubinemia, history of viral hepatitis, Gilbert’s disease, Dubin Johnson syndrome were excluded.

Methodology

Data was collected by interview with the participant with help of structured proforma, clinical examination, blood routine examination, Alvarado score, ultrasound abdomen, histopathology examination, pre and postoperative values of total bilirubin, direct bilirubin and indirect bilirubin. The upper limit of normal value in our laboratory for total bilirubin was 1.4 mg/dl (direct- 0.3 mg/dl, indirect- 1.1 mg/dl).

Statistical Analysis

The patient information was recorded in Microsoft Office Excel 2019 and subsequently integrated into SPSS (IBM Corp., Armonk, NY). IBM SPSS Statistics for Windows, Version 26.0 (IBM Corp.) was utilized for data analysis. For descriptive statistics, simple counts and percentages were employed, coupled with the chisquare test to demonstrate differences in means. For all tests, a 95% level of confidence and a p-value of less than 0.05 were considered significant.

Results

Table 1: Distribution of acute appendicitis in complicated and uncomplicated cases

Type of appendicitis	Number	Percentage
Acute appendicitis(uncomplicated)	55	55
Perforated appendicitis	15	15
Gangrenous appendicitis	13	13
Suppurative appendicitis	17	17
Total	100	100
Gender		
Male	62	62
Female	38	38
Total	100	100

In our study 62 (62%) were males and 38 (38%) were females. Out of the 100 cases 45 were complicated.

Table 2: Distribution of cases based on preoperative elevated bilirubin

Type of appendicitis	Bilirubinelevated	Normal bilirubin	Total
Acute appendicitis(uncomplicated)	25	27	52
Gangrenousappendicitis	10	5	15
Suppurativeappendicitis	12	5	17
Perforated appendicitis	13	3	16
Total	60	40	100

60 cases had elevated bilirubin and 40 cases had normal bilirubin.

Table 3: Total leucocyte count

TLC (cells/mm ³)	Number	Percentage
<4000	6	6
4000-11,000	54	54
>11,000	40	40

Out of 100 cases 40 patients had a total leucocyte count more than 11000.

Discussion

Acute appendicitis is a prominent etiological factor contributing to the occurrence of acute abdominal conditions. Approximately 7% of the populace may experience the manifestation of this ailment at some juncture in their lifetimes, with up to 20% of those individuals encountering a perforation as a consequence. [16] Appendectomy is a commonly performed emergent abdominal surgery and is typically the first significant intervention undertaken by a surgeon in the process of acquiring skills and experience. Frequently, the process of arriving to an accurate diagnosis might provide challenges. The presence of traditional symptoms and indicators of appendicitis may be absent. The diagnosis of acute appendicitis may sometimes be challenging due to the presence of several clinical signs and symptoms that may resemble other conditions. This is especially true in female patients, since there are multiple factors that might contribute to pain in the right iliac fossa. The clinical diagnosis of acute appendicitis continues to provide a prevalent surgical challenge. The process of accurately diagnosing a condition may be facilitated by the use of supplementary testing, expectant care, or a combination of both approaches. These factors have the potential to prolong the time before laparotomy is performed, resulting in appendiceal perforation and subsequently causing higher levels of morbidity and an extended duration of hospitalization. [17-19] The diagnosis of appendicitis relies on a comprehensive assessment including patient history, physical examination, laboratory analyses, and medical imaging. In some instances, the manifestations and indications exhibit variability, posing challenges in establishing a definitive diagnosis.

As far as appendicitis is concerned, bilirubin is not a generally recognized marker. Raised bilirubin levels have been shown in prior studies to be a good and specific marker for perforated appendicitis. [20,21] Among the adult surgical population, elevated bilirubin levels are frequently the consequence of liver or gallbladder disorders. [22] Hepatic dysfunction caused by sepsis has been extensively studied. [23] In acute appendicitis, the rise of serum bilirubin is thought to be caused by microorganisms and bacterial toxins migrating via the portal vein and eventually being metabolized by the liver. [24] The dysfunctionality of the hepatocytes, driven by the toxic nature of the

bacterial products and the product of the inflammatory response influences bilirubin excretion. [25] When the appendix wall is damaged, microorganisms and endotoxins can migrate out of the appendix lumen and into the portal system. After that, the inflammatory cytokines potentially end up in the liver, where they could trigger intrahepatic cholestasis. Our findings of rising bilirubin levels with increasing appendicitis severity are consistent with previous studies showing that *Escherichia coli* endotoxin produces dose-dependent cholestasis. [26]

In our study 62 (62%) were males and 38 (38%) were females which was similar to studies by Chaudary et al and Atahan et al. [27,28] In a study by D'Souza et al elevated total bilirubin preoperatively showed significant diagnostic value of complicated appendicitis. [29] Out of the 100 cases 45 were complicated. 60 cases had elevated bilirubin and 40 cases had normal bilirubin. Out of 100 cases 40 patients had a total leucocyte count more than 11000. In a study of 157 patients by Estrada et al patients with suppuration were significantly more likely to have hyperbilirubinemia. Appendicular perforation was 3 times higher for patients with hyperbilirubinemia when compared to normal bilirubin levels. [30] From our study preoperative hyperbilirubinemia was a predictor of complicated appendicitis similar to a study by Fabio Silva et al. [31]

Conclusion

Patients diagnosed with appendicitis who have significant levels of bilirubin are at a higher risk for experiencing complications such as perforation, gangrene, and suppuration. The proper diagnosis of acute appendicitis may pose challenges for surgeons. However, our findings indicate that the measurement of blood bilirubin levels can serve as a robust predictor for the existence of complex appendicitis. Tuberculosis (TB), when used in conjunction with other diagnostic markers such as white cell count (WCC), C-reactive protein (CRP), and clinical presentation, exhibits heightened sensitivity and specificity in the identification of individuals at risk of developing complex appendicitis.

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