



ORIGINAL RESEARCH PAPER

General Surgery

AN OBSERVATIONAL STUDY OF EVALUATION OF HYPERBILIRUBINEMIA AS A DIAGNOSTIC MARKER FOR ACUTE APPENDICITIS AND ITS ROLE IN THE PREDICTION OF APPENDICULAR PERFORATION

KEY WORDS:
Hyperbilirubinemia, uncomplicated appendicitis, appendiceal perforation

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ABSTRACT
Background: One of the most frequent causes of abdominal pain necessitating immediate treatment is appendicitis. There are many other conditions that can cause right iliac fossa discomfort, particularly in women. Additional testing may help achieve an accurate diagnosis. Delay in diagnosis can result in appendiceal perforation with higher morbidity. The purpose of this study was to assess hyperbilirubinemia as a potential diagnostic indicator for Acute uncomplicated appendicitis and perforated appendix. **Aim:** To determine the role of hyperbilirubinemia in the early diagnosis of patients with Acute uncomplicated appendicitis and perforated appendix. **Methodology:** It is a hospital based analytical cross-sectional study carried out in Dept. of General Surgery, Dr. Pinnamaneni Siddhartha Institute of Medical Sciences & Research foundation. **Result And Conclusion:** It appears that serum bilirubin levels may aid in the diagnosis of a perforated appendix as bilirubin readings above the normal range should be considered at a higher risk of appendiceal perforation.

INTRODUCTION

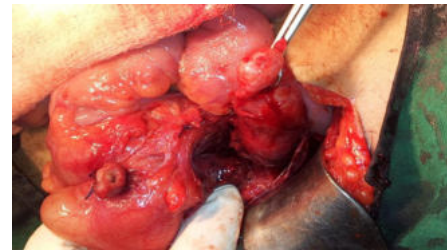
Appendicitis is the most frequent cause of an acute surgical abdomen across all age groups. The clinical differentiation between acute uncomplicated appendicitis and perforated appendicitis can be challenging, particularly in the elderly and pediatric population. A delayed diagnosis and subsequent appendiceal perforation may result in a potentially fatal illness.

Appendicitis is caused by bacteria entering the muscularis propria of the appendix more easily as a result of mucosal ulceration in the early stages of appendicitis. This inflammatory response raises intraluminal pressure and results in ischemia necrosis of the mucosa, which leads to tissue gangrene or perforation. Cytotoxin aided the slow invasion or transfer of microorganisms into the hepatic parenchyma via the portal pathway. Pro inflammatory cytokines infiltrate the liver parenchyma and interfere with bilirubin excretion, leading to hyperbilirubinemia and elevated inflammatory markers.

The mortality rate of acute uncomplicated instances of simple appendicitis is 0.3% and 6% in ruptured appendix. This study aimed at hyperbilirubinemia as a preoperative laboratory marker for predicting appendiceal perforation and acute, uncomplicated appendicitis.



Acute uncomplicated appendicitis



Perforated appendix with base ligated and cut

Aims

Determine the role of hyperbilirubinemia in the early tdiagnosis of patients with Acute uncomplicated appendicitis and perforated appendix.

Objectives

1. To establish sensitivity and specificity of bilirubin levels in early assessment of Acute uncomplicated appendicitis.
2. To establish bilirubin level as a standard laboratory marker for diagnosis of appendicitis.

Methodology

Study Design: A hospital based analytical cross-sectional study

Period Of Study: A period from July 2022 to July 2024

Study Area: Dr Pinnamaneni Siddhartha Institute of Medical Sciences & Research foundation, Gannavaram.

Study Population: During the two year study period, a total of fifty (50) patients of Acute uncomplicated appendicitis and perforated appendix were evaluated in this study.

Sampling Technique: Using „random number function“ (RAND) in microsoft excel, Acute uncomplicated appendicitis and perforated appendix cases with proper inclusion criteria were chosen for taking part in the study.

Methodology:

The following tests would be carried out for patients diagnosed as “Acute uncomplicated appendicitis” or “Perforated appendix”.

- I. Smear for excluding hemolytic anemia.
- II. Bilirubin (Total & Direct-bilirubin)
- III. Liver Enzymes, which include -
 - a. SGPT (Alanine transaminase)
 - b. SGOT (Aspartate transaminase)
 - c. ALP (Alkaline phosphatase)
- IV. HbsAg card test
- V. Urine examination (routine & microscopy)
- VI. S amylase
- VII. C-reactive protein
- VII. CT-scan- if USG negative for appendicitis but bilirubin is elevated

RESULTS

Table 1: Total Bilirubin values in uncomplicated Acute uncomplicated appendicitis cases

Total bilirubin (mg/dL)	Patient distribution with uncomplicated Acute Appendicitis (n=36)	
	Number	Percentage
> 1.0	24	66.67
≤ 1.0	12	33.33
Total	36	100

24 patients (66.67 percent) of the 36 patients with uncomplicated appendicitis had elevated bilirubin levels (>1.0 mg/dL), while the remaining 12 (33.33 percent) had normal levels (less than 1.0 mg/dL).

Table 2. Total serum bilirubin levels in perforated appendix patients.

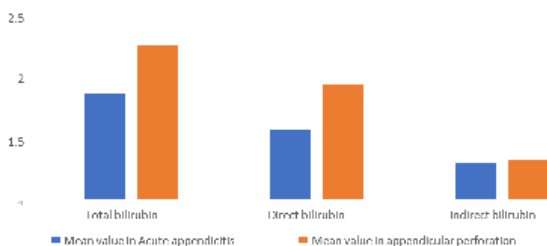
Serum bilirubin	Patient with perforated appendix (n=14)	
	Number of patients	Percentage of patients
> 1.0	12	85.72
< 1.0	2	14.28
Total	14	100

12 (85.75%) of the 14 patients with perforated appendix had increased bilirubin values (> 1.0 mg/dL), while the other 02 patients (14.28) had normal bilirubin levels (≤ 1.0 mg/dL). Mean value of TLC among our study group (50) was 10998±3219/mm³, of which the neutrophils were highest percentage with 70.9%, and 24.56% was by Lymphocytes.

Table 3. Pre-Operative clinical Diagnosis

Pre-Operative clinical Diagnosis	Distribution (n=50)	
	Number of cases	Percentage of cases
Acute uncomplicated appendicitis	42	84
Perforated appendix	8	16
Total	50	100

42 (84%) were diagnosed clinically as uncomplicated appendicitis, the 08 (16%) others were diagnosed as perforated appendix clinically



Graph 1

The mean bilirubin levels in uncomplicated appendicitis were 1.4 ± 0.75 mg/dL, while they were 2.12 ± 1.31 mg/dL in patients with perforated appendix. In Acute uncomplicated appendicitis patients, the mean levels of Direct bilirubin and Indirect bilirubin were 0.9 ± 0.6 mg/dL and 0.507 ± 0.28, respectively. In perforated appendix the mean values of Direct bilirubin and Indirect bilirubin were 1.58 ± 1.26

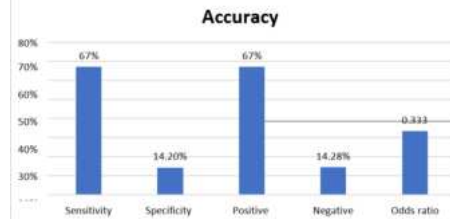
Table 4: Total Bilirubin Values Vs Uncomplicated Appendicitis And Perforated Appendix

Serum bilirubin	Total cases (n=50)			
	uncomplicated appendicitis (n=36)		Perforated appendix (n=14)	
	No.	%	No.	%
> 1.0	24	66.67	12	85.71
≤ 1.0	12	33.33	2	14.29
Total	36	100.00	14	100.00

24 (66.67 percent) of 36 patients with uncomplicated appendicitis had increased bilirubin values (> 1.0 mg/dL), while 12 (33.33 percent) had normal bilirubin values (≤1.0 mg/dL).

Whereas 12 patients (85.71%) had increased bilirubin values (> 1.0 mg/dL) and 02 patients (14.29%) had normal bilirubin values (≤ 1.0 mg/dL) among the 14 patients with perforated appendicitis.

Overall study accuracy is charted as below



DISCUSSION

Inflammation of the appendix is a significant public health problem with a lifetime incidence of 8.6% in men and 6.7% in women, with the highest chance of occurring in the second and third decade of life.

The etiology of appendicitis is due to luminal obstruction that occurs as a result of lymphoid hyperplasia and it could be fecaliths, fibrosis, foreign bodies (food, parasites, calculi), or neoplasia in adults. Early obstruction leads to bacterial overgrowth of aerobic organisms in the early period, and subsequently leads to mixed flora. Obstruction generally leads to increased intraluminal pressure and refer visceral pain to the periumbilical region. This is believed to result in impaired venous drainage, mucosal ischemia leading to bacterial translocation, and subsequent gangrene and intraperitoneal infection. E. coli and B. fragilis are the most common aerobic and anaerobic bacteria isolated in perforated appendix.

Despite breakthroughs in several laboratory and radiographic techniques, diagnosing appendicitis remains a big challenge. Increased serum bilirubin values can aid in the prediction of uncomplicated appendicitis, as well as anticipating as well as minimising the potential consequences of the condition.

The purpose of this research was to find out serum bilirubin as a laboratory marker to assist in the management of uncomplicated appendicitis. The significance of hyperbilirubinaemia, its relationship to Acute uncomplicated appendicitis has recently been proposed.

In the current study, 23 (46%) of the 50 patients enrolled were males, while the remaining 27 (54%) were females. Bilirubin had a 67 % sensitivity and 14.2 % specificity in predicting uncomplicated appendicitis and perforated appendix, respectively. Similarly, bilirubin had a positive predictive value of 67 % and a negative predictive value of 14.28 % in predicting the same respectively. Odds ratio was calculated as 0.333.

Summary

Acute uncomplicated appendicitis is the most common cause of "acute abdomen" in young people. The goal of this study was to determine the association between hyperbilirubinemia and Acute uncomplicated appendicitis, as well as to study the role of increased bilirubin as a diagnostic marker for acute uncomplicated appendicitis and in predicting the diagnosis of a perforated appendix. The current study was undertaken during July 2022 and July 2024 and , in the Department of Surgery at Dr Pinnamaneni Siddhartha institute of medical sciences , Gannavaram. A total of 50 patients were studied, all of whom had a clinical diagnosis of Acute uncomplicated appendicitis or perforated appendix.

Males (46%) and females (54%) participated in the study. Mean value of Total bilirubin is 1.5 ± 0.8 mg/dL, for direct bilirubin it is 1.0 ± 0.7 mg/dL and indirect bilirubin was 0.512. Mean values of AST and ALT were 29.6 ± 12.7 U/L and 24.12 ± 9.5 U/L, respectively. Mean of ALP levels were 76.04 ±25.8 U/L.

Only 28% of individuals had normal bilirubin levels, whereas 72% had elevated bilirubin levels (Hyperbilirubinemia). A total of 66.67 percent of 36 patients with Acute uncomplicated appendicitis had elevated bilirubin levels, whereas 33.3 percent had normal values. Perforated appendix was found in 14 patients, with 12 (85.75%) having elevated bilirubin levels and the remaining 02 (14.28%) having normal levels. Patients with acute uncomplicated appendicitis had mean bilirubin levels of 1.45 ± 0.75 mg/dl and those with perforated appendix had mean bilirubin values of 2.12 ± 1.31 mg/dL. In individuals with Acute uncomplicated appendicitis, the direct and indirect bilirubin levels were 0.9 ±0.64 mg/dL and 0.50 ± 0.28, respectively. In individuals with perforated appendix, the direct and indirect bilirubin levels were 1.58 ±1.26 mg/dL and 0.530.17 mg/dL, respectively.

The bilirubin levels of 24 patients (66.67 percent) with Acute uncomplicated appendicitis (n=36) were found to be elevated, while 12 patients (33.3 percent) have regular bilirubin values. Similarly, 12 (85.75%) of the total of 14 participants with diagnosis of Perforated appendix had increased bilirubin levels, whereas 02 patients (16%) had normal bilirubin levels. Serum bilirubin's sensitivity and specificity in predicting acute uncomplicated appendicitis and perforated appendix were 67 % and 14.2 %, respectively. Although serum bilirubin values are considered to be a potential laboratory marker for identifying Acute uncomplicated appendicitis, appendicitis is still primarily diagnosed clinically. Patients with appendicitis symptoms with hyperbilirubinemia that is two times the usual range should be considered at greater risk of perforated appendix, meaning that serum bilirubin levels can predict perforated appendix.

CONCLUSION

- The presence of elevated serum bilirubin levels seem to be a promising laboratory marker for diagnosing acute, uncomplicated appendicitis, the majority of cases of appendicitis are still diagnosed clinically. Its level was a good indicator for identifying acute, simple appendicitis and would help with decision-making.
- Patients who exhibit symptoms of appendicitis and have bilirubin levels above the normal range should be

considered more likely to experience an appendix perforation; this suggests that measuring bilirubin levels in serum may aid in the diagnosis of appendicitis.

REFERENCES

1. Saxena D, Tandon M, Shah Y, Gedam BS. Hyperbilirubinemia as a Diagnostic Tool for the Prediction of Appendicular Perforation: A Prospective Study. *Euroasian J Hepatogastroenterol.* 2015 Jul- Dec;5(2):87-89. doi: 10.5005/jp-journals-10018-1141.
2. CJK, O'Connell PR (Ed.). *Bailey and Love's - Short practice of surgery.* 25 ed. London: Arnold; 2021; p. 1204-8.
3. Stanely W (eds) *Maingot's abdominal operations.* 11th ed. Ashely: McGraw Hill; 2017. p. 589-612.
4. John Maa. "The Appendix". In Townsend CM, Beauchamp RD, Evers BM, Mattox KL, eds. *Sabiston Textbook of Surgery.* 21st ed. Philadelphia, Pa: Saunders Elsevier; 2021. p: 1333-1347.
5. Von von Tittle SN, Mc Cabe CJ, Ottinger IW. Delayed appendectomy for appendicitis causes and consequences. *Am J Emerg Med.* 2016; 14:620.
6. Grönroos JM, Grönroos P. A fertile-aged woman with right lower abdominal pain but unelevated leukocyte count and C-reactive protein: Acute uncomplicated appendicitis is very unlikely. *Langenbecks Arch Surg* 2019; 384:437-40.