



## TO STUDY AND ESTABLISH CORRELATION BETWEEN RAISED SERUM BILIRUBIN AND APPENDICITIS

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### ABSTRACT

Acute appendicitis is one of the most commonly observed cause of "Acute abdomen". Appendectomy is the most commonly performed emergency abdominal operation and is often the first major procedure performed by a surgeon in training. Hyperbilirubinemia is a new diagnostic tool for perforation of appendix. Hyperbilirubinemia is the result of imbalance between synthesis and excretion of bilirubin by the liver.

**KEYWORDS :** Appendicitis, Appendicular perforation, Appendectomy, Bilirubin

### INTRODUCTION

Acute appendicitis is one of the most commonly observed cause of "Acute abdomen"<sup>1</sup>. Appendectomy is the most commonly performed emergency abdominal operation and is often the first major procedure performed by a surgeon in training<sup>2</sup>. The diagnosis of Appendicitis still remains a dilemma in spite of advances in the radiological and laboratory investigations<sup>3</sup>. Experienced clinicians accurately diagnose appendicitis based on a combination of history, physical examination and laboratory studies about 80% of the time<sup>4</sup>. Though most patients of Acute Appendicitis are easily diagnosed, some cases present with uncommon and varied clinical signs and symptoms making a firm diagnosis difficult<sup>5</sup>. This is particularly true where the appendix is retrocaecal or retroileal.

The percentage of appendectomies performed where appendix subsequently found to be normal varies 15-50% and postoperative complications can occur in up to 50% of these patients<sup>5</sup>. Delay in diagnosis of Acute Appendicitis leads to perforation and peritonitis and increased mortality<sup>6</sup>. A safe alternative seems to do appendectomy as soon as the condition is suspected. This kind of management plans unnecessarily increases the number of appendectomies. A timelier and more accurate diagnosis has been attempted by the employment of additional laboratory tests, scoring systems, ultrasound imaging, computed tomography (CT) scan, scintigraphy, MRI, and laparoscopy<sup>7</sup>. None of these methods stand alone as they all come in support of, and are secondary to a primary clinical assessment<sup>8</sup>.

Hyperbilirubinemia is a new diagnostic tool for perforation of appendix<sup>9</sup>. Hyperbilirubinemia is the result of imbalance between synthesis and excretion of bilirubin by the liver<sup>10</sup>. Along with the nutrients and other substances absorbed from gut, the portal blood vessels also carry bacteria and its product (toxins). It is commonly cleared by detoxification and immunological action of the reticuloendothelial system of the liver that acts as first-line defense in clearing toxic substances, bacteria and its products<sup>11</sup>. But when bacterial load overwhelms the Kupffer cell function, it may cause dysfunction or damage to hepatocytes (liver parenchyma). This occurs due to the rise of serum bilirubin (SB) alone or along with the elevation of the liver enzymes that depends on the type, severity and site of the lesions<sup>12</sup>.

In this context, the present study was designed as an attempt to evaluate the association of hyperbilirubinemia and severity of acute appendicitis. The study also aimed at evaluating whether elevated serum Bilirubin has a predictive potential for the diagnosis of appendicular perforation.

### METHODS

A prospective study conducted at tertiary care centre over period of 24 months. After applying inclusion and exclusion criteria patients were enrolled in study.

### INCLUSION CRITERIA:

1. All patients presenting with right iliac fossa pain clinically suggestive of appendicitis or appendicular perforation.

2. Only the patients undergoing emergency Appendectomy.
3. Age group 12 to 60 yrs.

### EXCLUSION CRITERIA :

1. All patients documented to have a past history of jaundice or liver disease, positive HbsAg, cholelithiasis, cancer of hepatobiliary system, hemolytic disorders.
2. Pregnancy or other urological and gynecological disorders.
3. Patients below 12 year and above 60 years of age.
4. Patients undergoing interval Appendectomy.
5. Patients managed conservatively.

### Detailed study procedure:

Patients presenting in tertiary care centre with clinical suspicion of Acute appendicitis or appendicular perforation and those patients who are fitting into the inclusion criteria and giving consent were taken for study. History was noted with respect to the onset of symptoms and its progression over time and clinical examination was done in detail. Patients were subjected to investigations like Complete blood counts, Liver function tests, Peripheral smear, Ultrasonography of the abdomen and pelvis.

### DISCUSSION

The present study was conducted at the Surgery outpatient department of a tertiary care center in patients presenting with Acute Appendicitis to evaluate the predictive value of bilirubin for predicting appendicular perforation. The study comprised of 109 subjects with appendicitis with majority of the subjects (71.6%) below the age of 30 years. Around 36.7% of patients were of age less than 20 years. However, there is no exemption of any particular age group. This predilection for younger ages can be explained by the common causative organisms affecting young people that in turn lead to acute inflammation of the appendix.

Male patients (62.4%) were far more in the present study than the female patients.

Most common presenting symptom was found to be pain in 97.2% of the patients, followed by fever in 55.0%, vomiting in 40.4%, nausea in 26.6% and diarrhoea in 9.2% in the present study. However, the common clinical signs and symptoms that are observed may mimic the diagnosis of acute appendicitis, as there are a number of causes leading to pain in right iliac fossa particularly in female patients.

Most common and the least common clinical signs observed in present study was tachycardia (HR > 90 beats/min) in 71 (65.1%) patients and RR > 16/min in only 2 (1.8%) patients respectively. Other clinical signs included SBP > 120 mm hg in 31 (28.4%) and DBP > 80 mm hg in 21 (19.3%) of the cases. Other less frequent clinical signs were pallor in 4 (3.7%) and Icterus in 3 (2.8%) of them.

On local examination, clinical signs observed in present study were softness in 85.3% patients, tenderness in 98.2%, rebound tenderness in 25.7% and guarding in 13.8% patients. Based on these findings there

are certain specific clinical signs like the Rovsing's sign, Obturator sign or the Psoas sign that can be elicited for the localization of the pain and for assessing RIF guarding and tenderness, particularly when the duration of symptoms is less than 48 hours and even later than that.

These findings from the local examination hold great significance as they are a part of several clinical scores used for determining the severity of appendicitis. The RIPASA score was first proposed by CF Chong et al in order to diagnose acute appendicitis. It includes parameters like age, sex, symptoms such as right iliac fossa (RIF) pain, pain migration to RIF, anorexia, nausea, vomiting, duration of symptom and signs such as RIF tenderness, guarding, rebound tenderness, Rovsing's sign, temperature between 37-39 degrees celcius etc as the individual scoring items assessed on general and local examination. It also includes certain laboratory investigations such as elevated white blood cell count and negative urine analysis (absence of blood, WBCs, bacteria) for assigning a score 83.

Another popularly used scoring system is the ALVARADO score for diagnosing acute appendicitis with various symptoms such as pain migration to RIF, anorexia, nausea vomiting, signs such as RIF tenderness, rebound tenderness, fever and investigations such as raised WBC, shift of WBC to left with total scoring of 1084.

Most common provisional diagnosis in the present study was acute appendicitis in 82.6% of the patients, appendicular perforation in 18.5% of patients of the and chronic appendicitis in 1 (0.9%) of the cases. Out of all study subjects, it was revealed by ultrasonography that, in most of the cases 89 (81.7%), key finding was Acute Appendicitis, perforated appendix was present in 14 (12.8%) cases and chronic appendicitis in 1.8% of cases.

Out of 109 subjects in the present study, appendicectomy was performed in 73 (67.0%) of the cases, Lap appendicectomy was done in 33 (30.3%) of them and laparotomy was done in 3 (2.8%) of the cases.

On laboratory investigations, 40.4% patients with appendicitis have haemoglobin less than 12gm%.

Majority of the cases in the study 81 (74.3%) had a raised WBC count (> 11,000 cells / mm<sup>3</sup>) and only 4 (3.7%) had low (< 4000 cells / mm<sup>3</sup>) WBC counts.

Serum bilirubin level among study subjects was elevated (>1 mg%) among 33.9% of the subjects and 72% had normal bilirubin levels (<1 mg%). Hyperbilirubinemia is the result of imbalance between production and excretion of bilirubin by the liver. It may be because of hepatocellular, cholestatic or haemolytic diseases. In cases of acute appendicitis it mostly corelates with the infection of the appendix including bacteria and its product (toxins) that interferes with the bilirubin excretion from the hepato-biliary system due to poor Kupffer cell function as a result of bacterial overload. The inflammation may lead to dysfunction or damage to the hepatocytes as well as the liver parenchyma. This results in an acute rise in the serum bilirubin (SB) alone or in combination with other liver enzymes depending upon the type, severity and site of the lesion 82.

In our study, elevated serum bilirubin levels (> 1 mg%) were significantly associated with perforated appendix in 11 (29.7%) of the cases as compared to 7 (9.7%) of those with serum bilirubin levels of ≤ 1 mg% (P<0.007724). It was observed that serum bilirubin as a marker of appendicular perforation exhibited Sensitivity of 61.6%, with a specificity of 71.4%. The predictive value for positive test was found to be 29.7% and the predictive value for a negative test or for bilirubin levels < 1mg% was found to be 90.3% (p<0.0001).

In our study, the mean value of bilirubin in appendicular perforations is 1.16 mg/dl.

Therefore, within the reasonable diagnostic accuracy limits exhibited in our study, in suspected cases of acute appendicitis elevation of serum bilirubin levels beyond 1 mg % can be used as a criterion to suspect and further evaluate for appendicular perforation.

**RESULTS**

The above graph shows that majority of the study subjects 78 (71.6%) were below the age of 30 years. There were 40 (36.7%) cases in the age

group of <20 years, 38 (34.9%) in the age group of 21-30 years and 16 (14.6%) cases in the age group of >40 years of age. The mean age of the study participants was 26.4 years with a range of 14-48 years and a standard deviation of 8.2 years. (Graph 1)

The above table shows that majority 106 (97.2%) of the participants complained of pain, followed by fever in 60 (55.0%), vomiting in 44 (40.4%), nausea in 29 (26.6%) and diarrhea in 10 (9.2). (graph 2 ) It was observed that the commonest clinical sign was tachycardia (HR > 90 beats/min) in 71 (99.1%) and least common was RR > 16/min in 2 (1.8%) patients respectively, followed by SBP > 120 mm hg in 31 (28.4%) and DBP > 80 mm hg in 21 (19.3%). Other less frequent clinical signs were pallor in 4 (3.7%) and Icterus in 3 (2.8%) of them.(graph 3)

On local examination, it was observed that abdominal tenderness was the commonest sign in 107 (85.3%), softness was present in 93 (85.3%) of the cases, followed by rebound tenderness in 28 (25.7%) and guarding in 15 (13.8%) of the cases.(Graph 4)

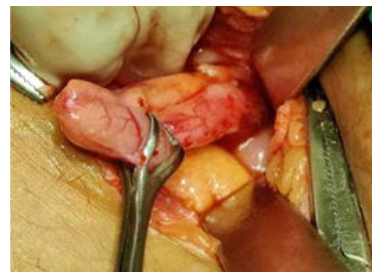
It was observed that, Acute appendicitis was the commonest provisional diagnosis among 90 (82.6%) of the cases and sub-acute appendicitis in 17 (15.6%) of them. Chronic appendicitis and appendicular perforation were found in 1 (0.9%) each respectively. (Graph 5)

Majority of the cases 81 (74.3%) had a raised WBC count (> 11,000 cells / mm<sup>3</sup>) and only 4 (3.7%) had low (< 4000 cells / mm<sup>3</sup>) WBC counts. ( Graph 6)

It was observed that the serum bilirubin levels were normal in majority of the cases 72 (66.1%) of the cases and were elevated in 37 (33.9%) of the cases. (Graph 7)

The above table shows that elevated serum bilirubin levels (> 1 mg%) were significantly associated with perforated appendix in 11 (29.7%) of the cases as compared to 7 (9.7%) of those with serum bilirubin levels of < 1 mg% (P<0.007724). ( table 8)

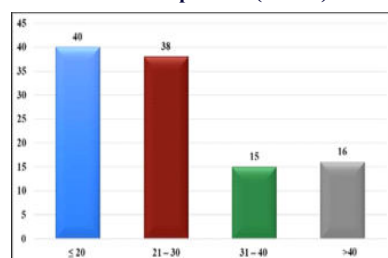
**Photo 1: Inflamed appendix**



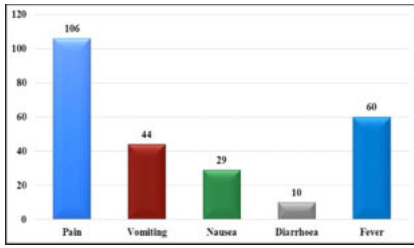
**Photo 2: Postoperative specimen of Gangrenous appendicitis**



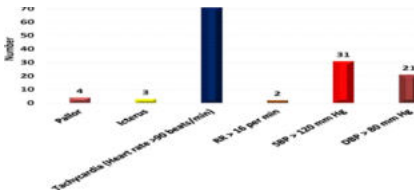
**Graph 1: Age wise distribution of patients (N=109)**



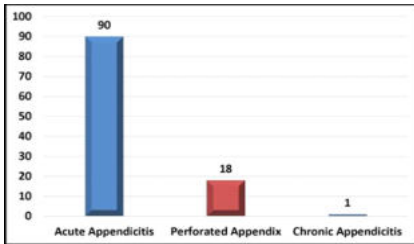
**Graph 2 : Distribution of study participants according to chief complaints (N=109)**



**Graph 3 : Distribution of patients according to positive clinical signs on general examination (N=109)**



**Graph 4 : Distribution of patients according to provisional diagnosis (N=109)**



**Table 5: Distribution of patients according WBC counts (N=109)**

WBC counts	Number	Percentage
Elevated > 11,000 cells / mm <sup>3</sup>	81	74.3
Normal (4000 -11,000 cells / mm <sup>3</sup> )	24	22.0
Low (< 4000 cells / mm <sup>3</sup> )	4	3.7
Total	109	100

**Table 6 : Distribution of patients according to Total serum bilirubin levels (N=109)**

Serum Bilirubin Levels	Number	Percentage
Normal (< 1 mg%)	72	66.1
Elevated (> 1 mg%)	37	33.9
Total	109	100

**Table 7 : Distribution of cases according to Intra-operative findings (N=109)**

Intraoperative Findings	Number	Percentage
Inflamed appendix	91	83.5
Perforated appendicitis	18	16.5
Normal appendix	0	0.0

**Table 8 : Sensitivity Analysis for Bilirubin as a marker for appendiceal perforation (n=109)**

Serum Bilirubin levels	Appendicular Perforation	
	Present	Absent
>1 mg%	11	26
< 1 mg%	7	65
Total	18	91

Sensitivity, specificity, predictive value of positive test, predictive value of negative test is as follows.

Sensitivity	61.6%
Specificity	71.4%
Positive Predictive value	29.7%
Negative Predictive value	90.3%

P<0.0001

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