

## ASSESSMENT OF HYPERBILIRUBINEMIA IN ACUTE APPENDICITIS

Sanjiv Kumar Sahi,<sup>1\*</sup> Binod Kumar Rai,<sup>2</sup> Ajit Singh,<sup>3</sup> Sujit Singh<sup>4</sup><sup>1</sup> Department of General Surgery, National Medical College and Teaching Hospital, Brigunj, Parsa, Nepal.<sup>2</sup> Department of Pediatric Surgery, National Medical College and Teaching Hospital, Brigunj, Parsa, Nepal.<sup>3</sup> Department of Emergency Medicine, Institute of Medicine, TUTH, Kathmandu, Nepal.<sup>4</sup> Department of Anesthesia, Institute of Medicine, TUTH, Kathmandu, Nepal.**Date of Submission** : May 15, 2023**Date of Acceptance** : July 14, 2023**Date of Publication** : July 28, 2023**\*Correspondence to:**

Sanjiv Kumar Sahi, Department of General Surgery, National Medical College and Teaching Hospital, Birgunj, Parsa, Nepal.

Phone No: +977-9869768206

Email: sanjivbinita93@gmail.com

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**ABSTRACT****Introduction:** Acute appendicitis is the most common cause of 'acute abdomen' in young adults. Appendectomy is the most common surgery performed by a surgeon. However, sometime diagnosis is difficult to make in such case either the diagnosis is missed or patients with normal appendix are operated which lead to increase in morbidity and mortality. The aim of this study was to assess the relationship between hyperbilirubinemia and acute appendicitis and to see whether elevated bilirubin levels have a predictive potential for the diagnosis of appendicular perforation.**Methods:** This prospective study was carried out in Department of Surgery of National Medical College and Teaching Hospital. A total of 85 patients were included in this study. Data analysis was done using SPSS (Statistical Package for social sciences), version 26.**Results:** In this study, mean age was 28.86 year. Males (68.23%) outnumbered females (31.76%). Of the 85 patients, 62 patients were diagnosed as simple appendicitis while 23 patients were diagnosed with appendicular perforation. Out of 23 patients of appendicular perforation, 19 patients (82.60%) had raised bilirubin levels. The sensitivity, specificity, positive predicative value and negative predicative value of serum bilirubin as a marker in predicting acute appendicitis and appendicular perforation was 82.60%, 88.70%, 73.07%, 93.22% respectively.**Conclusions:** Serum bilirubin level appear to be a new laboratory marker in helping to diagnose a case of acute appendicitis.**Keywords:** Acute Appendicitis, Appendicular Perforation, Hyperbilirubinemia**INTRODUCTION**

Acute appendicitis is the commonest cause of acute surgical abdomen.<sup>1</sup> The diagnosis of appendicitis still remains a dilemma in spite of advances in the radiological and laboratory investigations.<sup>2</sup> Experienced clinicians accurately diagnose appendicitis on basis of history, physical examination and laboratory studies.<sup>3</sup> Delay in diagnosis of acute appendicitis leads to perforation and peritonitis and increased mortality.<sup>4,5</sup>

To reduce negative appendectomy laboratory investigations like white blood cell counts and C-reactive protein values have been used.<sup>6</sup> Various scores like Alvarado score and Modified Alvarado score are help to reach the diagnosis.<sup>7</sup> However till date there is no confirmatory laboratory marker for the pre-operative diagnosis of acute appendicitis and appendicular perforation.

It is well-known that when microbes invade the body, leukocytes defend it. This leads to increase in the leukocyte count. Bacterial invasion in the appendix leads to transmigration of bacteria and the release of proinflammatory cytokines such as TNF-alpha, IL6 and cytokines. These reach the liver via superior mesenteric vein and may produce inflammation, abscess or dysfunction of liver either directly or indirectly by altering the hepatic blood flow.<sup>8,9,10</sup> Which led to the theory that hyperbilirubinemia may possess inferential potential in the preoperative early diagnosis of appendix perforation.<sup>11</sup>

Aim of this study was to conclude whether the serum bilirubin can be considered as a new laboratory marker to help in the diagnosis of acute appendicitis and if so, does it have the predictive capacity to notify us about appendicular perforation, so that prior to the exploration

we can manage the condition in terms of explaining the prognosis of disease, wound infection, and requirement of emergent nature of surgery.

## MATERIALS AND METHODS

This prospective study was carried out in Department of Surgery, National Medical College and Teaching Hospital, Birgunj over a period of 6 month from November 2022- April 2023. Approval was taken from Institutional review committee [Ref: F-NMC/614/079-080].

Total 85 patients admitted with clinical diagnosis of acute appendicitis were included in this study.

The sample size was calculated based on the following formula.

$$N = Z^2 \times p \times q / d^2$$

Where, n = Sample size, Z = 1.96  $\approx$  2 (considering confidence as 95%), p = prevalence (prevalence is taken as 50% as exact prevalence is not known), q = 100 – p that is, 50%, d = Absolute error which was 10%

Also, sensitivity, specificity, positive predictive value and negative predictive value was determined by 2 x 2 table as below

Serum bilirubin level			Total
	Appendicular Perforation	Acute Appendicitis	
Raise serum bilirubin	A	B	a+b
Normal serum bilirubin	C	D	c+d
Total	a+c	b+d	

$$\text{Sensitivity: } a/(a+c) \times 100$$

$$\text{Specificity: } d/(b+d) \times 100$$

$$\text{Positive predictive value: } a/(a+b) \times 100$$

$$\text{Negative predictive value: } d/(c+d) \times 100$$

After taking the informed consent data was collected using the proforma. History taking and physical examined was done in a systematic manner. Relevant investigations were done. All patients with suspected or suspicious of acute appendicitis/gangrenous/perforated appendicitis were subjected to liver function tests. After confirming the diagnosis either clinically or radiologically or both combined and after taking the informed consent, the patients underwent open appendectomy.

Descriptive statistics such as mean, SD and percentage were used to present the data. To assess, the association factors with SSI, chi-square test was used. A p-value less than 0.05 was considered as significant. Data analysis

was performed using software SPSS.

## RESULTS

The present study was conducted among 85 patients who underwent appendectomy over a period of 6 months were included in this study. The mean age of the study population was 28.86 years. The majority of the subjects were in the age group of 21-30 years. Most of the patients were males 68.23% and 31.76% were females. Total 62 patient were diagnosed as acute appendicitis and 23 patients were case appendicular perforation.

Table 1: Distribution of patients by age and sex

Age (year)	Male	Female	Total
<20	16	6	22
21-30	18	12	30
31-40	10	8	18
41-50	9	1	10
>50	5	0	5

Table 2: Correlation of acute appendicitis and appendiceal perforation with total serum bilirubin levels (Intra-operative)

Serum bilirubin level	Intraoperative		P Value
	Appendicular perforation	Acute Appendicitis	
>1.2 mg/dl	19 (82.60%)	7 (11.29%)	<0.00001
< 1.2 mg/dl	4 (17.39%)	55 (88.70%)	
Mean total bilirubin	2.8 $\pm$ 1.01	1.2 $\pm$ 0.84	

Table 3: Analysis results

Measures	
Sensitivity	82.60 %
Specificity	88.70 %
Positive predictive value	73.07%
Negative predictive value	93.22 %

## DISCUSSION

In our study mean age of the patient was 28.86 year. The maximum age was 66 years and minimum age was 16 years. Peak incidence of acute appendicitis was seen in age group 21-30 years. A study conducted by Raj RS et al<sup>12</sup> shows that peak incidence of acute appendicitis was 13-30 year, similarly in studies conducted by Divish Saxena et al.<sup>13</sup>, Cheekuri SK et al.<sup>14</sup> that peak incidence was seen in 21-30 year (46%) and 21-30 year (34.54%) respectively.

The mean total serum bilirubin in our study was 1.73  $\pm$  1.16 mg/dl (range, 0.64– 2.82 mg/dl), which was above the normal range ( $\leq$  1.2 mg/dl) considered for the study, hence indicating the occurrence of hyperbilirubinemia.

The mean total bilirubin in acute appendicitis is  $1.2 \pm 0.84$  were as in appendicular perforation  $2.8 \pm 1.01$ . A study conducted by Divish Saxena et al.<sup>13</sup> shows that 91.5 % of patients had elevated bilirubin. Khalid Metal.<sup>15</sup> also shows elevated bilirubin levels ( $1.67 \pm 0.87$  v/s  $0.35 \pm 0.12$ ) in case of appendicular perforation.

The sensitivity and specificity of serum bilirubin as a marker in predicting acute appendicitis and appendicular perforation was 82.60% and 88.70% respectively. Similarly, the positive predicative value and negative predicative value for the same was 73.07% and 93.22% respectively with significant p value  $< 0.0001$ . Similar study conducted by Cheekuri SK<sup>14</sup> shows that sensitivity, specificity, PPV, NPV was (47.6%, 90.9%, 88.5% and 61.5%) respectively.

Similarly, Mankad M et al.<sup>16</sup> revealed that sensitivity was 90.02%, Specificity was 90.35%, Positive predictive value and negative predictive value 82.1% and 94.9% respectively with p value of 0.01. Divish Saxena et al.<sup>13</sup> also show that the sensitivity, specificity, PPV, NPV was 92.82, 75 and 83.09% respectively. A study conducted by D'souza et al.<sup>17</sup> showed sensitivity, specificity, PPV, NPV (70%, 82%, 47%, 93%) respectively. S. Khan et al.<sup>18</sup> also shows sensitivity, specificity, PPV, NPV (87%, 100%, 100%, 17.3%) respectively.

A study done by Hong YR et al.<sup>19</sup> and Chaudhary P et al.<sup>20</sup> also found that total serum bilirubin including both direct and indirect was found to be significantly increased in case of acute suppurative appendicitis. Serum bilirubin was much higher ( $P < 0.0005$ ) in appendicular perforation

## CONCLUSION

This study concludes that incidence of hyperbilirubinemia in patients with appendicular perforation is very high. So, we recommend that serum bilirubin level can be added to the routine investigations in suspected case of acute appendicitis in order to improve outcome subsequently reduces patient morbidity and mortality.

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