

The Role of Hyperbilirubinaemia as a New Diagnostic Marker for Appendicitis

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Abstract: *Acute appendicitis is the most common surgical emergency and a leading cause of acute abdomen. Delay in surgical intervention can result in complications such as gangrene, perforation, abscess formation, peritonitis, and increased morbidity. While various diagnostic scoring systems exist, they lack the ability to predict complications such as appendicular gangrene or perforation. This study aimed to evaluate the diagnostic and predictive value of elevated total serum bilirubin levels as an indicator of complicated appendicitis. A prospective observational study was conducted over 1.5 years at the Akash Institute of Medical Science and Research Centre, Bangalore. A total of 60 patients aged 18 years and above, diagnosed clinically with acute appendicitis and undergoing emergency appendectomy, were included. Serum bilirubin levels were measured preoperatively and correlated with intraoperative findings and postoperative histopathology, classifying cases into uncomplicated and complicated appendicitis. Out of 60 patients, 49 (81.73%) had acute uncomplicated appendicitis, while 11 (18.26%) had complicated appendicitis (perforation or gangrene). Elevated serum bilirubin levels (>1.0 mg/dL) were observed in 90.4% of patients with complicated appendicitis compared to 31% of those with uncomplicated cases. The sensitivity, specificity, positive predictive value, and negative predictive value of serum bilirubin in predicting complicated appendicitis were 90.4%, 69.14%, 89.58%, and 77.01%, respectively ($p < 0.0001$). Elevated total serum bilirubin levels serve as a significant, cost-effective, and easily available predictive marker for complicated appendicitis. Incorporating bilirubin measurement in the diagnostic evaluation of suspected appendicitis can aid in early identification of complications, enabling timely surgical intervention and improved outcomes.*

Keywords: Acute appendicitis, Serum Bilirubin, Perforated appendix, gangrenous appendicitis, complicated appendicitis

1. Introduction

Acute appendicitis is the most common surgical emergency and commonest cause of acute abdomen. Surgical delay in the prompt management of the subjects with appendicitis leads to dreaded complications. Gangrene or perforation can lead to appendicular abscess formations, localized/generalized peritonitis, faecal fistula formation, intestinal obstruction due to adhesion formation, portal pyaemia, with overall increased morbidity and prolonged hospital stay. The mortality rate for uncomplicated, non-perforated appendicitis is 0.1–0.5% while that of perforated appendicitis is much higher, ranging from 3% overall to as high as 15% in elderly subjects. Several diagnostic scoring systems are commonly used in clinically suspected cases but these scoring systems do not assess the risk of complications like appendicular gangrene or perforation.

Aims & Objective

Aim of the present study is to evaluate the diagnostic role and predictive value of elevated total serum bilirubin level as a diagnostic parameter of complicated appendicitis.

2. Materials and Methods

Source of data: Inpatients in emergency in Department of General Surgery at the Akash Institute Of Medical Science and Research Centre.

Study design: A Prospective observational study

Study period: One and half years.

Place of study: Akash Institute of Medical Science and Research Centre, Bangalore

Study population: 60 subjects

Inclusion Criteria

All cases of clinically diagnosed acute appendicitis of age 18 years and above, who underwent emergency appendectomy.

Exclusion Criteria

Patients with histopathological report suggestive of normal appendix.

All patients with positive HbsAg and HCV status.

Patients with past/present history of hepatobiliary disease.

Patients with Hemolytic anemia.

3. Methodology

All patients fulfilling the criteria were evaluated by detailed history and thorough clinical examination on initial contact. After clinical confirmation of acute appendicitis, the blood investigations were done for all participants.

After initial stabilization, these patients were operated on emergency basis.

Finally, clinical diagnosis was confirmed by post operative histopathological examination and categorizing subjects as.

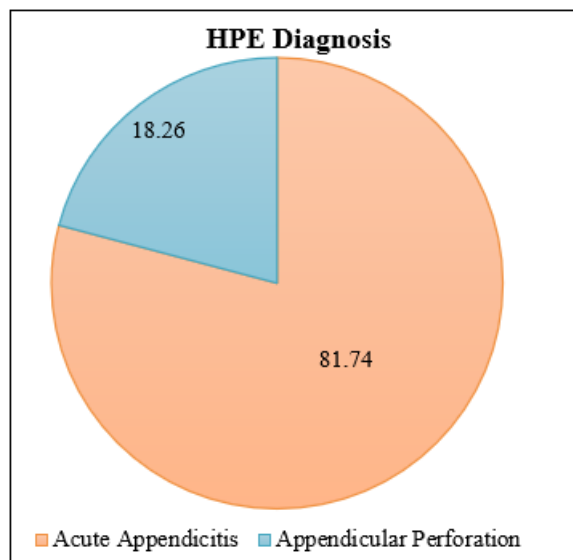
- 1) Negative for the study (having normal appendix or acute uncomplicated appendicitis)

- 2) Positive for the study (Acute Appendicitis with perforation/ gangrene).

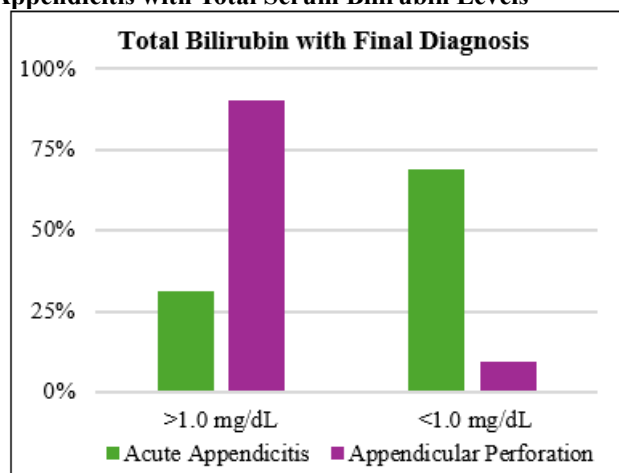
4. Results

Histopathological Diagnosis

HPE Diagnosis	Number	Percentage
Acute Appendicitis	49	81.73%
Complicated appendicitis	11	18.26%



Correlation of Acute Appendicitis and Complicated Appendicitis with Total Serum Bilirubin Levels



Serum Bilirubin (mg/dL)	Final Diagnosis (n=60)			
	Acute Appendicitis (n= 49)		Complicated appendicitis (n=11)	
	Number	Percentage	Number	Percentage
>1.0	15	31%	10	90.40%
≤ 1.0	34	69%	1	9.5%
	49	100%	11	100%

The sensitivity and specificity of serum bilirubin as a marker in predicting complicated appendicitis was 90.4% and 69.14% respectively. Similarly, the negative predictive value and positive predictive value for the test is 77.01% and 89.58% respectively with p value <0.0001.

5. Discussion

Acute appendicitis continues to be a significant surgical emergency worldwide, and timely diagnosis is crucial to prevent complications such as gangrene, perforation, and peritonitis. While clinical scoring systems like the Alvarado score aid in diagnosing appendicitis, they do not reliably predict the severity or likelihood of complications. Therefore, there is a need for simple, accessible markers that can help differentiate complicated from uncomplicated cases.

In this study, elevated total serum bilirubin levels (>1.0 mg/dL) were strongly associated with complicated appendicitis. Among the 11 patients with perforated or gangrenous appendicitis, 90.4% had elevated bilirubin, compared to only 31% in uncomplicated cases. This suggests that hyperbilirubinemia may be a valuable marker for early identification of complicated appendicitis.

The proposed mechanism behind elevated bilirubin in complicated appendicitis involves bacterial translocation and endotoxemia, which impair hepatic function and bilirubin clearance. Particularly in cases of perforation or gangrene, the systemic inflammatory response may further exacerbate hepatic dysfunction.

The sensitivity and specificity values observed in this study (90.4% and 69.14%, respectively) are consistent with previous studies supporting the diagnostic role of serum bilirubin. The high positive predictive value (89.58%) indicates its reliability in predicting complications when elevated.

Incorporating serum bilirubin testing into the routine diagnostic workup for suspected appendicitis can assist clinicians in identifying patients at higher risk of complications. This may prompt earlier surgical intervention, potentially reducing morbidity and hospital stay.

However, the relatively small sample size is a limitation, and larger multicenter studies are recommended to validate these findings further.

6. Conclusion

This study highlights the significant diagnostic and predictive value of elevated total serum bilirubin levels in identifying complicated cases of acute appendicitis, such as those involving gangrene or perforation. The findings demonstrate that serum bilirubin levels >1.0 mg/dL are strongly associated with complicated appendicitis, with high sensitivity (90.4%) and a notable positive predictive value (89.58%). These results suggest that hyperbilirubinemia can serve as a reliable and cost-effective biochemical marker in clinical settings where rapid risk stratification is essential.

Incorporating serum bilirubin testing into the standard diagnostic protocol for suspected appendicitis, especially in emergency settings, may enhance clinical decision-making. It offers a valuable tool in prioritizing patients for early surgical intervention, particularly when radiological findings are equivocal or resources are limited. By facilitating earlier identification of high-risk patients, it may also contribute to

reducing the incidence of postoperative complications, lowering healthcare costs, and improving overall patient outcomes.

While the results are promising, it is important to acknowledge the study's limitations, including the relatively small sample size and single-center design. Future research involving larger, multi-institutional cohorts and comparative analysis with other inflammatory markers is recommended to further validate the utility of serum bilirubin in predicting complicated appendicitis.

In conclusion, total serum bilirubin is not only a routine and inexpensive laboratory parameter but also a potentially powerful adjunct in the early diagnosis of complicated appendicitis. Its routine measurement in suspected cases may play a pivotal role in improving surgical outcomes and patient care.

Ethical Clearance: Obtained from the Institutional Ethics Committee

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