



The Predictive Value of Total Bilirubin for Acute in Retrospect

Hassan A Saad*, Mohamed E Eraky, Ahmed K El-Tahe, Mohamed Riad, Mohamed I Farid, Khaled Sharaf

Department of Surgical, Zagazig University, Egypt

ABSTRACT

Objective: The present study aimed to examine the clinical importance of preoperative total bilirubinaemia in patients with acute and determine whether it has any practical application for predicting severe.

Methods: A retrospective analysis of appendectomies was performed at a single hospital (636 cases of acute presenting to the emergency department between December 2019 and January 2023). Using multivariate analysis, we examined predictive data for complex (perforated or gangrenous), including demographics, sex, white blood cell count, degree of C-reactive protein elevation, high-temperature peritoneal signs and indicators, and total bilirubin levels.

Results: Those with total bilirubin (>1.1 mg/dL), high C-reactive protein levels (>0.5 mg/dL), positive peritoneal irritated symptoms, and temperature (>37.3 C) had considerably higher rates of acute. Age (>64 years), hyperbilirubinemia, high CRP levels, and fever (odds ratios of 3.36, 1.75, 7.61, and 2.43, respectively) were identified by multivariate analysis as the associated risks for complex. This is particularly true for those aged <65 years.

Conclusion: High temperature, elevated CRP level, and high total bilirubin level were good predictors of acute, especially in patients younger than 65 years; however, the total bilirubin level was a more precise indicator.

Keywords: Gangrenous; Perforated or ruptured; High total bilirubin; C-reactive protein; High temperature; Age

INTRODUCTION

An appendectomy has an overall lifespan threat of about 7% (8.6% for men and 6.7% for women) [1]. The male: Female ratio was 1.4:1. Teenagers are frequently affected by (the highest prevalence, approximately 40%, occurs during the second decade of life, that is, 10 years-19 years, and 70% of subjects are under 30 years of age). At this age, serious is rather uncommon [2]. The mortality rate increases with age (45% in the under-5 age group and 51% in the over-65 age group) [3]. The incidence of death for simple, non-perforated is 0.1-0.5%, but it fluctuates between 3% globally and 15% in older people for ruptured [4]. A minor risk of wound infection, sticky gastrointestinal obstruction, and hernias is associated with inappropriate appendectomy. The Alvarado score is a scoring system for that is based on clinical characteristics, physical check-up findings, and laboratory data [5]. To identify individuals who are most likely to have and must be given surgical consideration, quick,

affordable lab screening that is selective for acute may be helpful, in addition to clinical indications.

Complex acute has been studied to find a clinical biomarker for this illness [6]. The transfer of Gram-negative bacteria from the to the portal system and liver, where they interrupt bilirubin evacuation through endotoxin-mediated disturbances, can explain serum bilirubin increase [7]. Additional studies have revealed that septic-induced haemolysis is a significant contributor to elevated blood bilirubin levels in acute complex [8]. Waste products of bilirubin in bile canaliculi are hampered by this occurrence. In the current investigation, it has been established that a high level of bilirubin is associated with gangrenous or perforated [9]. This study aimed to evaluate the use of hyperbilirubinemia as a diagnostic indicator for acute. This study aimed to assess total blood bilirubin level as a preoperative diagnostic indicator of acute complex in a group of individuals with confirmed acute who underwent appendectomy.

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Corresponding author Hassan A Saad, Department of Surgical, Zagazig University, Egypt, E-mail: ebramos_2010@yahoo.com

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MATERIALS AND METHODS

Single-institution, retrospective cohort work. Between January 2019 and December 2023. A patient with acute underwent appendectomy at the emergency unit of Zagazig University Hospital. Demographic and sex characteristics, WBC count (CRP) elevation, high temperature, peritonitis, and blood bilirubin levels were used as preoperative patient data and were divided into two groups: The uncomplicated, simple, or uncomplicated group (phlegmonous or catarrhal type) and the complex or complicated group (gangrenous or perforated). The age group of <65 years was a special attention group. We examined the preoperative clinical features of the two groups and used multivariate analysis to identify risk factors for complex. We relied on retrospective histopathological findings and associations for the individual classification of Complicated and Non-complicated cases.

Research Population's Standard

We established the inclusion and exclusion criteria according to patient selection, with some attention paid to patients under 65 years of age, who usually have a lower possibility of liver diseases that may conflict with our total bilirubin level results.

Selection Standards for the Investigation

Inclusion Criteria

This study included all patients with experimentally confirmed acute who underwent removal at the Urgent Care Surgery Department of our hospital, except for the excluded cases.

Exclusion Criteria

- Ongoing alcohol use for over 10 years
- Dubin-Johnson condition: Gilbert syndrome, a case of haemolytic illness (conjugated hyperbilirubinemia with an incidence of approximately 6%)
- Biliary, congenital, or acquired diseases
- Severe hepatitis (any cause)
- People with past digestive tract cancer
- Previous or current use of toxic liver drugs in previous years
- Benign, persistent cholestasis of the liver in each case: Establishing the standard value for blood bilirubin count in the research population
- Asymptomatic positive histological findings of appendicular malignancy.

Table 1: Patients with complicated (perforated or gangrenous) and uncomplicated (phlegmonous or catarrhal) appendicitis are distinguished by their characteristics and preoperative data from totally admitted cases (n=636)

	Complicated appendicitis (n=203)	Uncomplicated appendicitis (n=433)	P value	Patients
Age (years)	0	52.4	39.6	0.019
Gender (male; female)	0	01:01.1	01:01.8	0.046
WBC	0	12,661/ μ L	11,545/ μ L	0.067
	>11,000/ μ L	148 (73%)	190 (44%)	0.202
CRP	0	9.87 mg/dL	3.04 mg/dL	<0.001

Study Methodology

Good history, clinical exam. And diagnostic confirmation of acute. Regular laboratory tests, Full Blood Count (CBC), platelet count, PT, PTT, and INR were performed to rule out presumptive hemolytic anemia. Hepatitis marker, liver function, Serum CRP Level, testing for kidney function and fasting glucose levels. USG imaging of the entire abdominal region, fecolith, ECG, digital chest X-ray with PA belief.

The next were the recognised typical ranges for the present research:

Blood bilirubin level Direct Bilirubin=0.1-0.3 mg/dl; Total=0.3-1.0 mg/dl.

ALT (0-40 U/l), AST (0-40 U/l), and ALP (30-130 U/l) were the normal values for liver enzymes. However, we used the total bilirubin level as a predictive factor in our study.

Statistic Data

Easy geometric statistical analysis was performed using available software, which was considered statistically significant for Windows. SPSS Version 23 (SPSS Inc., Chicago, IL, USA) was used for the statistical analysis. Clinic pathological characteristics of the two groups were compared using two-tailed t-tests. Binomial logistic models were used for multivariate analysis, with adaptations for variables that were significant in the univariate analysis. Furthermore, the sensitivity and specificity of laboratory values reported to have a substantial correlation with complicated were predicted using the Receiver Operating Characteristic (ROC) curve and Area Under the Curve (AUC). A p-value of less than 0.05 and a degree of confidence of 95% were used to determine the significance of all tests.

RESULTS

The age of the patients fluctuated between 14 years and 74 years, with a mean age of 45.0 and 272 males (42.7%). The median WBC calculated was 12,015/L (interquartile range: 1000/L-35,300/L), the median CRP elevation was 5.92 mg/dL (interquartile range: 0-39.2), and the mean serum total bilirubin level was 1.1 (range, 0.3 mg/dL-4.5) mg/dL. Catarrhal and phlegmonous simple types (433 uncomplicated, 68%), and 203 were complicated by perforation or gangrene (32%).

(Table 1), about difficult multivariate analysis showed that age (>65 years) ($P<0.001$), rising CRP ($P<0.001$), high bilirubin ($P=0.038$), and high temperature ($P=0.001$) were serious variables, for univariate and multivariate variables for all patients (Table 2).

	>0.5 mg/dL	192 (94.5%)	277 (64%)	<0.001
Total bilirubin	>1.1	1.18 mg/dL	1.03 mg/dL	0.07
High temperature	>37.3°C	113 (56%)	136 (31.5%)	<0.001
Peritoneal signs	0	177 (68.7%)	239 (55.2%)	0.017

Table 2: Univariate and multivariate variables for all patients (n=636)

Total bilirubin level	(N=636)	Mean	SD	t	df	p-value	Peritoneal signs
Pre-operative (mean)	Complicated appendicitis (n=203)	1.19	0.98	0.346	8.85	109	<0.05
	Uncomplicated appendicitis (n=433)	0.69	0	0	0	0	0
Post-operative on Day 7 (mean)	Complicated appendicitis (n=203)	0.79	0.69	0.104	0	0	0
	Uncomplicated appendicitis (n=433)	0.69	0	0	0	0	0

Duration of Pain

This study revealed relationship between mean duration of pain and complicated among the study population. The mean duration of pain was shorter for subjects with an acute uncomplicated ($9.0 \text{ h} \pm 5.12 \text{ h}$ range 6 h-12 h) compared to those with a gangrenous/perforated ($20.2 \text{ h} \pm 1.49 \text{ h}$, range 14

h-36 h), it reached statistical significance ($p < 0.05$). The scatter plot diagram shows a linear relationship between the increase in the total bilirubin level (0.0396 times) and the duration of pain (each hour) (Figure 1). Between the increase in total bilirubin level (0.0396 times) and the increase in the duration of pain (each hour).

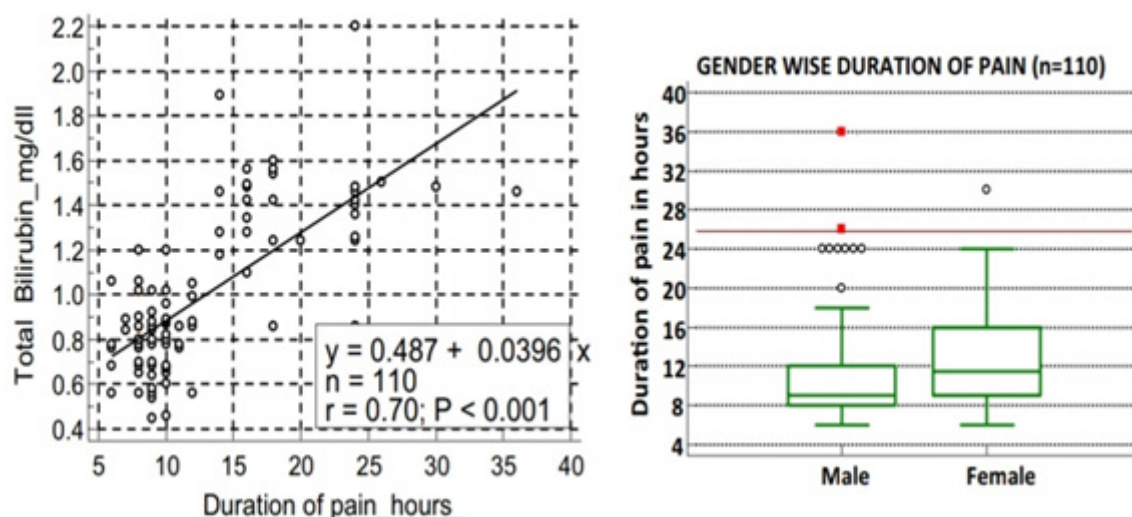


Figure 1: Linear regression analysis of relationship between pain duration and total bilirubin and gender wise duration of pain (n=636)

Total Bilirubin Pre-and Postoperative

Hyperbilirubinemia occurs in the gangrenous or perforated appendices. The total serum bilirubin level had a sensitivity of 91.43% (76.942% to 98.196%) and specificity of 88% (78.439% to 94.363%) in predicting complex. The probabilities of success and failure were, respectively, 78.03% and 95.65%. Assuming that the incidence of serious was 31.8%, the affirmative and negative odds ratio were found to be 7.619 and 0.097, respectively (Table 2).

In participants with complex, there was a significant increase in both types of bilirubin, making it a mixed-type. The average Total Bilirubin Level for all individuals with simple reached 0.790.16 mg/dl (range: 0.45 mg/dl-1.20 mg/dl), while it was 1.190.26 mg/dl (range: 0.68 mg/dl-2.20 mg/dl) for complex. Both values had p-values of >0.05 . Therefore, participants with complex (perforated or gangrenous) reported greater Preoperative and postoperative total bilirubin levels than

those with simple acute. The ROC curve control and criteria parameters are shown in Figure 2. This Receiver Operating Pattern (ROC) curve, which considers the overall incidence of complex across every instance, demonstrates the diagnostic utility of total serum bilirubin levels for more complex. The ideal criteria emerged at a total bilirubin level of 1.06 mg/dl, the ideal criteria emerged.

DISCUSSION

In the emergency room, abdominal pain can frequently be triggered by acute, affecting 7-22 of 10,000 individuals [10-13]. Appendectomy can recover uncomplicated (phlegmonous or catarrhal), but complicated (perforated or gangrenous) can result in consequences such as infective peritoneal bacterial infestation, urinary disorders, bowel collapse, or the development of abscess formation. Diagnosis of during a medical crisis. Gilbert's syndrome has a 6% frequency but can

also result in solitary indirect hyperbilirubinemia; therefore, it was excluded from our research for conflicting reasons [14]. These side effects can be fatal, emphasizing the importance of accurate assessment and prompt treatment. However, because there are many different symptom patterns, making a conclusive diagnosis is challenging. Particularly in silent patients, most doctors are forced to conduct repeated re-examinations, which lengthens hospitalization and delays the completion of treatment, potentially resulting in perforation [15]. The incidence of misinterpretation (15%) and appendiceal bursts has not changed despite the rise in diagnostic technologies such as Computed Tomography (CT) and ultrasound [16-18]. The relationship between and hyperbilirubinemia has been studied over the past decade. General peritonitis and sepsis are 2 diseases that can cause widespread infections that can lead to hyperbilirubinemia.

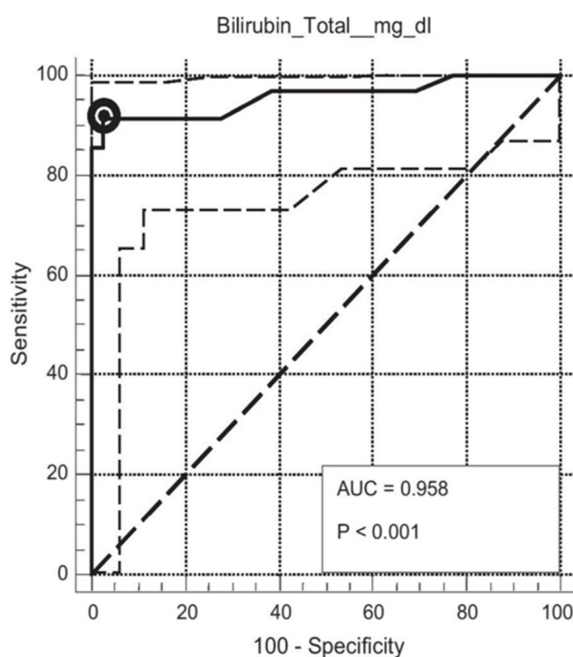


Figure 2: The clinical significance of elevated bilirubin in severe appendicitis occurrences with criteria values and ROC curve parameters (n=636)

Moreover, numerous pathways that cause hyperbilirubinemia in widespread infections have been identified. *Escherichia coli* and *B. fragilis* are the most frequent primary bacterial infections causing acute, and several bacterial infections have been proven to cause cholestasis (16-18.7). *E. coli* endotoxins are set on dose-dependent cholestasis, and the organism is also suited to causing erythrocyte hemolysis, which enhances bilirubin load. Additionally, in patients with complicated, intestinal lack of motion and edoema can result from crucial inflammation, as in complicated, and these ailments can lead to cholestasis. Therefore, these pathways may lead to hyperbilirubinemia in acute. has been previously associated with hyperbilirubinemia as an adverse effect. According to Svinc, et al. 3392 cases of perforated were closely associated with high bilirubin (>1.0 mg/dL) and a substantial neutron-to-lymph ratio (>4.8) (odds ratios of 2.6, 2.6, respectively) [10]. Additionally, in a study involving 162 patients, Eren, et al. discovered that higher levels of CRP (>0.5 mg/dL) and higher bilirubin (>1.2 mg/dL) were attributed to ruptured or ischemic gangrene of the Nomura, et al. demonstrated that higher bilirubin levels in 410 Japanese

individuals corresponded to a higher prevalence of ischemic gangrene in the (odds ratio, 1.7919) [11,12]. Age, elevated CRP levels, hyperbilirubinemia, and fever were associated with challenging in the current study. However, hyperbilirubinemia, high CRP levels, and fever have been linked to more complex in young people. Younger individuals have not been the focus of previous research. However, older patients frequently lack systemic functional reserves, which could result in an elevated proportion of false-positive results. Hyperbilirubinemia might thus be an improved signal in younger patients than in older patients.

Additionally, it may be challenging to obtain full recollection in the emergency room, with a higher likelihood of neglecting the patient's recent history. Nevertheless, older people are more likely to have initial hyperbilirubinemia than younger people are, implying that hyperbilirubinemia may be a predictive signal in younger people. Estrada et al. demonstrated that more participants with perforated or gangrene appendices had hyperbilirubinemia than those with simple acute, supporting the idea that hyperbilirubinemia may be linked to appendiceal perforation. In contrast to CRP, which had a specificity of only 35%, Sand, et al. found that hyperbilirubinemia had an 86% specificity for appendiceal perforation or gangrene [19,20]. Eren, et al. found that high CRP levels are a significant marker for gangrenous or ruptured [11]. Elevated CRP levels may be a significant marker of complex, because complicated is linked to more severe inflammation than uncomplicated. Similarly, Nomura, et al. found that older age is predictive of gangrenous [12]. Age-related immunological impairment causes inflammation to be more severe in older patients than in younger ones. This may help clarify why advanced age is an essential predictor of complex; therefore, we focused on patients aged <65 years. A previous study examined the relationships between various characteristics and the development of complex acute and found that a longer agony time, greater Alvarado score, and pyrexia were all associated with an increased risk of developing gangrenous or perforated. A USG scan is also useful in forecasting complex. The average outside thickness in the cases of complex was 9.71 mm. The likelihood of complex was further increased by the presence of faecal and peri-collections. Therefore, severe acute may lead to hyperbilirubinemia.

CONCLUSION

Although our findings imply that a high blood bilirubin level is a strong indication for the occurrence of complex, operators frequently struggles to diagnose acute accurately. When combined with other factors like WCC, CRP, and clinical signs, TB is more precise and accurate at predicting the individuals who will experience complex. To obtain conclusive findings regarding this issue, an additional study with a larger sample size is required. The risk of complications (gangrene or perforation) should be considered when analysing increases in serum bilirubin levels in patients with acute. The presence of serum hyperbilirubinemia, clinical symptoms, and standard laboratory test results may aid the initial management of patients with complex acute. High temperature, elevated CRP levels, and total bilirubin could be helpful indicators of acute severity, with hyperbilirubinemia proving to be more effective

in people aged <65 years than in those aged >65 years.

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Not applicable.

DATA AVAILABILITY

The datasets used and/or analysed during the current study are available from the corresponding author's request.

FUNDING

Not applicable.

ETHICS AND DECLARATIONS

This study was conducted in accordance with the Declaration of Helsinki and approval was obtained from the Institutional Review Board of Zagazig University Hospital on December 6, 2021 (No. #-12-06/2021). The need for informed consent was waived by the Zagazig University Institutional Committee of Medicine.

CONSENT FOR PUBLICATION

Not applicable.

CONFLICT OF INTEREST

The authors declare that this research was conducted in the absence of any commercial or financial relationships that could be construed as potential conflict of interest.

AUTHOR CONTRIBUTIONS

HAS, ME: Contributed to the conception and design of ME, AKE organised the database and performed the statistical analysis.

HAS, KS: Wrote sections of the manuscript and prepared tables.

MIF: Contributed to the manuscript revision.

All authors approved and equally shared the submitted version.

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