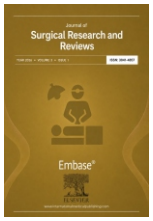
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Research Article

Section: General Surgery

To Analyse the Relationship between Hyperbilirubinemia & Acute Appendicitis: A Single Centre Prospective Observational Study

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HIGHLIGHTS

- Bilirubin indicates disease severity.
- Complicated cases showed hyperbilirubinemia.
- Bilirubin levels increased significantly.
- Liver enzymes remained comparable.
- Bilirubin may predict perforation.

Key Words:

Acute appendicitis
Hyperbilirubinemia
Serum bilirubin
Complicated appendicitis
Appendicular perforation

ABSTRACT

Introduction: Acute appendicitis is a common surgical emergency requiring timely recognition of complicated disease. Timely severity stratification remains clinically important. Serum bilirubin may reflect systemic inflammatory effects and has been investigated as an accessible adjunctive marker of appendiceal severity. **Aim & Objective:** To analyse the relationship between hyperbilirubinemia and acute appendicitis, compare bilirubin concentrations in uncomplicated and complicated cases, and assess its potential role in predicting appendicular perforation. **Materials & Methods:** This single-centre prospective observational study was conducted at G.R. Medical College and J.A. Hospital, Gwalior, between April 2024 and October 2025. Ninety patients aged 12 years or older with ultrasonographically diagnosed acute appendicitis were evaluated. Clinical findings, hematological indices, serum bilirubin fractions, liver enzymes, C-reactive protein and ultrasonographic findings were recorded. Surgical findings and histopathology were considered where available. Data were analysed using SPSS version 17.0. **Results:** The mean age was 40.42 ± 14.16 years, and 61.1% were male. Leukocytosis occurred in 30.0%, while 16 patients (17.8%) had total bilirubin exceeding 1 mg/dL. Mean total bilirubin was higher in complicated than uncomplicated appendicitis (1.28 versus 0.66 mg/dL), as were direct bilirubin (0.50 versus 0.21 mg/dL) and indirect bilirubin (0.80 versus 0.45 mg/dL). Of 90 patients, 61 received conservative management and 29 underwent surgery; complicated appendicitis was reported in 14 operated cases. Liver enzyme differences between groups were not statistically significant. **Conclusion:** Higher mean bilirubin concentrations in complicated appendicitis suggest possible usefulness for severity assessment alongside clinical examination and imaging. However, discrepancies in reported case classifications and bilirubin associations limit definitive conclusions and require verification.

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INTRODUCTION

Acute appendicitis is an inflammatory disorder of the vermiform appendix and a major cause of emergency surgical admission [1]. Although it occurs across all age groups, its burden is particularly prominent among adolescents and young adults. The Global Burden of Disease Study estimated approximately 17 million new cases worldwide in 2021, with an age-standardised incidence of 214 per 100,000 population [2]. Substantial geographical variation in incidence and mortality highlights differences in disease occurrence and access to timely care. These findings emphasise the continuing importance of accurate assessment and accessible diagnostic strategies in routine surgical practice [3].

The pathogenesis of appendicitis involves interactions between luminal obstruction, microbial activity and the host inflammatory response. Obstruction by an appendicolith or lymphoid enlargement may increase intraluminal pressure, impair venous drainage and compromise mucosal perfusion [4]. Progressive inflammation and bacterial invasion can subsequently produce ischaemia, tissue necrosis and perforation [5]. However, uncomplicated appendicitis does not invariably progress to perforation, and current understanding recognises potentially distinct disease trajectories. Complicated disease may involve gangrene, perforation, abscess formation or peritonitis, with greater risks of systemic infection and postoperative morbidity [6]. Gogoi and Gautam (2025) conducted a prospective study involving 90 patients with acute appendicitis and reported appendicular perforation in 25 patients (27.8%). Delayed presentation of 72 hours or more was observed in 88% of perforation cases, highlighting the importance of early diagnosis and timely intervention in preventing complications [7]. Consequently, assessment must address both the presence of appendicitis and the severity of the underlying pathological process [5].

Clinical presentation typically includes abdominal pain that begins around the umbilicus and localises to the right iliac fossa, accompanied by anorexia, nausea, vomiting or fever. Nevertheless, variation in appendiceal position, patient age and disease stage can produce atypical symptoms, while gastrointestinal, urinary and gynaecological disorders may mimic appendicitis [8]. Diagnosis therefore requires integration of history, physical examination, laboratory investigations and imaging [1]. Saket et al. (2026) conducted a prospective observational study involving 89 patients at J.A. Group of Hospitals, Gwalior, & reported concordance between clinical, ultrasonographic & intraoperative diagnoses in their study population. Their findings highlighted the complementary role of clinical assessment & ultrasonography in evaluating acute appendicitis [9]. Clinical scores, including the Appendicitis Inflammatory Response and Adult Appendicitis scores, support risk stratification and selection for further investigation. Current international recommendations retain laparoscopic appendicectomy as the standard surgical approach while recognising antibiotic treatment as an option for selected patients with uncomplicated disease, increasing the importance of reliable severity assessment [10].

Despite these advances, diagnostic uncertainty persists. Leucocytosis, neutrophilia and elevated C-reactive protein indicate inflammation but are insufficiently specific to establish appendicitis independently [11]. Ultrasonography avoids ionising radiation, although its performance depends on operator expertise & successful visualisation of the appendix. Computed tomography provides greater diagnostic certainty but entails radiation exposure and resource requirements. Moreover, identifying appendicitis does not necessarily ensure accurate discrimination between uncomplicated and complicated disease [6]. These limitations create a rationale for evaluating inexpensive biochemical variables that can complement established investigations. Such markers would be most valuable if they contributed additional information about disease severity without delaying imaging, surgical assessment or appropriate treatment

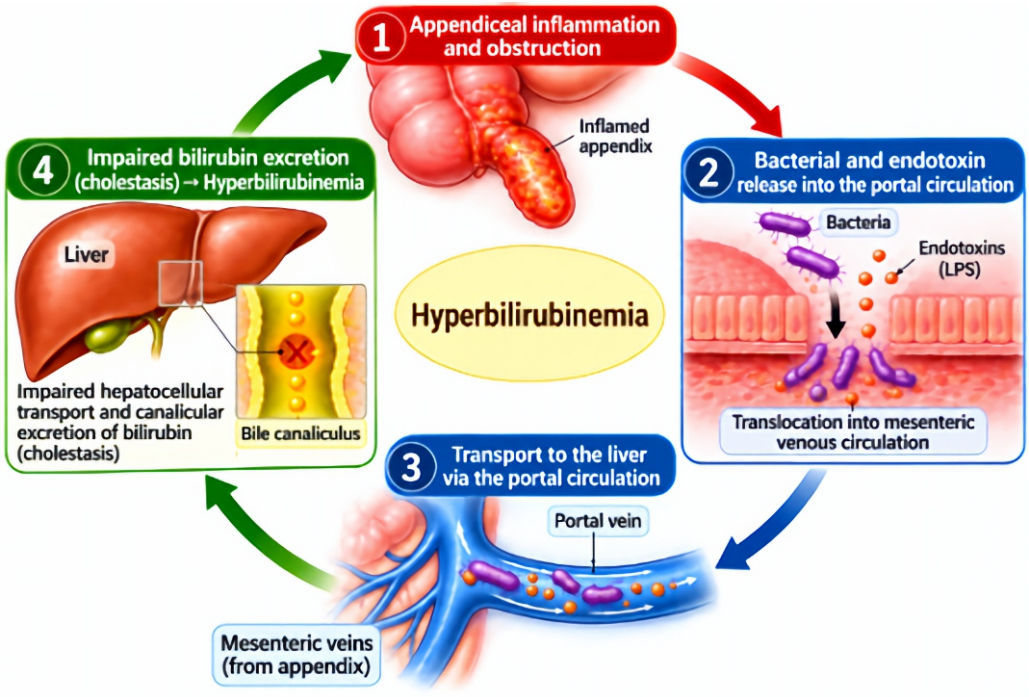


Figure 1. Mechanism linking acute appendicitis to hyperbilirubinemia.

[11]. Serum bilirubin has attracted interest because appendiceal infection may influence hepatic excretory function through the portal circulation [12]. Hyperbilirubinemia denotes a bilirubin concentration above the laboratory reference range and may occur without clinically apparent jaundice. A proposed mechanism involves increased portal delivery of bacteria and endotoxins following disruption of the inflamed appendiceal mucosal barrier. Endotoxin exposure and inflammatory cytokines may impair hepatocellular transport and canalicular bilirubin excretion, producing infection-associated cholestasis [13]. This provides a plausible biological explanation for raised bilirubin during severe appendiceal inflammation, although an observed association cannot establish the mechanism in individual patients. Bilirubin estimation is also inexpensive and widely available, supporting its potential practicality as an adjunctive investigation [13].

Clinical studies have reported an association between increased serum bilirubin and complicated appendicitis, including gangrenous and perforated disease. Both total and direct bilirubin have shown potential relevance, suggesting that their elevation may reflect the systemic consequences of more extensive inflammation [13]. However, reported diagnostic performance has varied, and available evidence does not support bilirubin as a reliable standalone test. A normal concentration cannot safely exclude appendicitis or its complications, while an elevated result cannot independently confirm either condition [14]. Its potential clinical contribution therefore lies in interpretation alongside symptoms, examination findings, conventional inflammatory markers and imaging, rather than in determining management through an isolated biochemical threshold [5].

Interpretation also requires attention to alternative causes of hyperbilirubinemia, including hepatobiliary disease, haemolysis, inherited disorders of bilirubin metabolism and relevant medication exposure [5]. Differences in patient selection, sampling time, laboratory thresholds and definitions of complicated appendicitis further limit direct comparison between published studies [14]. In particular, an association with perforation among patients already diagnosed with appendicitis should not be equated with diagnostic accuracy among all patients presenting with abdominal pain. These considerations indicate that local evaluation should distinguish an association with appendicitis from an association with its pathological severity, while accounting for factors that could independently alter bilirubin concentrations [5].

The present single centre prospective observational study seeks to examine the relationship between hyperbilirubinemia and acute appendicitis through systematic assessment of serum bilirubin, clinical findings and disease severity. Correlation with operative and histopathological findings, while considering relevant confounding factors, may clarify whether bilirubin provides useful supplementary information for routine clinical assessment and preoperative severity stratification within the local patient population.

Figure 1. Proposed pathophysiological mechanism linking acute appendicitis with hyperbilirubinemia through bacterial translocation, portal circulation and impaired hepatic bilirubin excretion. This single-centre prospective observational study aimed to analyse the relationship between hyperbilirubinemia and acute appendicitis, compare total serum bilirubin levels between uncomplicated and complicated cases, and evaluate its predictive potential for appendicular perforation. The objectives also included comparing the predictive roles of age, symptom duration, clinical profile, white blood cell count, C-reactive protein levels, and ultrasonographic findings in these patients.

MATERIALS & METHODS

This prospective observational study was conducted at G.R. Medical College and J.A. Hospital, Gwalior, from April 2024 to October 2025, involving 90 patients aged 12 years and above with ultrasonographically diagnosed acute appendicitis planned for surgery. Ethical approval and written informed consent were obtained. Patients underwent clinical assessment, blood counts, total and direct bilirubin estimation, liver enzyme testing, C-reactive protein measurement, and abdominal ultrasonography. Blood samples were collected within 30 minutes of presentation. Postoperative histopathology determined disease classification, including perforation or gangrene. Bilirubin levels were compared between uncomplicated and complicated cases. Statistical analysis was performed using IBM SPSS version 17.0.

RESULTS

The age distribution of 90 patients showed that the highest proportion belonged to the 31–40 years age group (30.0%), followed by 21–30 years (20.0%), with a mean age of 40.42 ± 14.16 years, indicating greater representation of adults in the study population. Male patients predominated (61.1%) compared with females (38.9%), showing a male preponderance among acute appendicitis cases. The mean age was comparable between males (40.22 ± 14.89 years) and females (40.55 ± 13.80 years), suggesting a similar age distribution across both sexes. These findings describe the demographic characteristics of the study population but do not independently establish an association with hyperbilirubinemia.

The total leukocyte count distribution showed that 70.0% of patients had counts below 11,000/mm³, while 30.0% had elevated counts. This indicates that leukocytosis was not consistently present in acute appendicitis cases, highlighting the importance of evaluating leukocyte count alongside clinical findings and other inflammatory markers, including serum bilirubin **(Table 1)**. The liver function tests showed a mean total bilirubin of 0.71 ± 0.36 mg/dL, with direct and indirect bilirubin levels of 0.24 ± 0.17 and 0.89 ± 3.96 mg/dL, respectively. Mean SGOT, SGPT, and ALP levels were 40.25, 32.70, and 87.90 U/L, respectively. These findings describe the biochemical profile of acute appendicitis patients but do not independently establish an association with hyperbilirubinemia **(Table 2)**. The distribution of total bilirubin levels showed that 74 patients (82.2%) had

normal levels (≤1 mg/dL), while 16 patients (17.8%) exhibited elevated levels (>1 mg/dL). This indicates that hyperbilirubinemia was present in a minority of acute appendicitis cases, suggesting that elevated serum bilirubin was not a consistent finding in the study population **(Figure 2)**.

The distribution of provisional diagnosis showed that the majority of patients (92.2%) had uncomplicated appendicitis, while 7.8% presented with complicated appendicitis (perforated/gangrenous). This indicates that uncomplicated appendicitis predominated in the study population, with relatively few severe cases. These findings provide a basis for evaluating the relationship between serum bilirubin levels and appendicitis severity **(Table 3)**.

The ultrasonography findings revealed that 76 patients (84.4%) had uncomplicated appendicitis, while 14 patients (15.6%) showed complicated appendicitis. This indicates that uncomplicated appendicitis predominated on USG, with a smaller proportion showing complicated disease. These findings provide a basis for assessing the relationship between serum bilirubin levels and appendicitis severity **(Figure 3)**.

The management and intra-operative findings showed that the majority of patients (67.8%) received conservative treatment, while 16.7% had uncomplicated appendicitis and 15.6% had complicated appendicitis on surgical evaluation. These findings indicate that most patients were managed without surgery, while complicated appendicitis was identified in a smaller proportion of the overall study population **(Table 4)**. The mean serum bilirubin levels were higher in complicated appendicitis than uncomplicated appendicitis, with total bilirubin (1.28 vs. 0.66 mg/dL), direct bilirubin (0.50 vs. 0.21 mg/dL), and indirect bilirubin (0.80 vs. 0.45 mg/dL). These findings suggest a possible association between elevated bilirubin levels and appendicitis severity, supporting its potential role as an adjunctive biochemical marker **(Figure 4)**. The mean SGOT (50.44 vs. 42.78 U/L), SGPT (41.64 vs. 35.08 U/L), and ALP (108.12 vs. 88.27 U/L) levels were higher in complicated appendicitis compared to uncomplicated cases. However, these differences were statistically insignificant (p = 0.452, 0.422, and 0.103, respectively), suggesting that liver enzyme levels were not significantly associated with appendicitis severity in the study population **(Table 5)**.

The mean hemoglobin (11.68 vs. 11.85) and platelet count (2.04 vs. 2.29) were lower in complicated appendicitis, whereas TLC was higher (12084.29 vs. 8914). However, the reported differences were statistically insignificant (p = 0.779, 0.475, and 0.158, respectively), suggesting no significant association between these hematological parameters and appendicitis severity **(Table 6)**.

The findings showed elevated bilirubin (>1 mg/dL) in 12 uncomplicated and 1 complicated appendicitis cases, while normal bilirubin levels were observed in 2 uncomplicated and 14 complicated cases. This suggests an inverse association between hyperbilirubinemia & appendicitis severity. However, these findings contradict the earlier bilirubin results and group totals, requiring verification before drawing a definitive conclusion **(Figure 5)**.

Table 1: Total Leukocyte Count

Total Leukocyte Count (/mm³)	No. of Cases	Percentage
< 11,000/mm³	**63**	**70.0**
> 11,000/mm³	**27**	**30.0**
Total	**90**	**100.0**

Table 2: Liver Function Tests

Liver Function Tests	Mean	SD
Total level of Bilirubin (mg/dl)	0.71	0.36
Direct level of Bilirubin (mg/dl)	0.24	0.17
Indirect level of Bilirubin (mg/dl)	0.89	3.96
SGOT (U/L)	40.25	24.81
SGPT (U/L)	32.70	20.91
ALP (U/L)	87.90	31.56

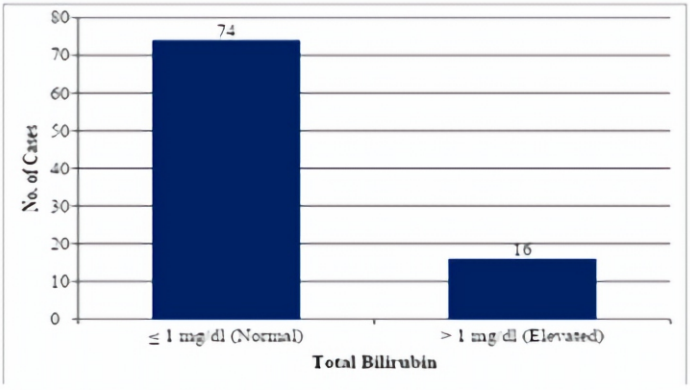


Figure 2: Distribution of cases according to Total Bilirubin levels

Table 3: Distribution According to Provisional Diagnosis

Diagnosis Type	No. of Cases	Percentage
Uncomplicated Appendicitis	83	92.2%
Complicated Appendicitis (Perforated/Gangrenous)	7	7.8%
Total	90	100.0%

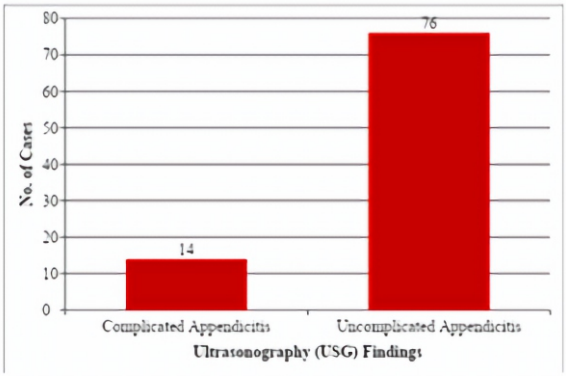


Figure 3: Distribution According to Ultrasonography (USG) Findings

Table 4: Distribution of Cases According to Management and Intra-operative Findings

Intra-operative Findings	No. of Cases	Percentage
Conservative Management	61	67.8%
Uncomplicated Appendicitis	15	16.7%
Complicated Appendicitis	14	15.6%
Total	90	100%

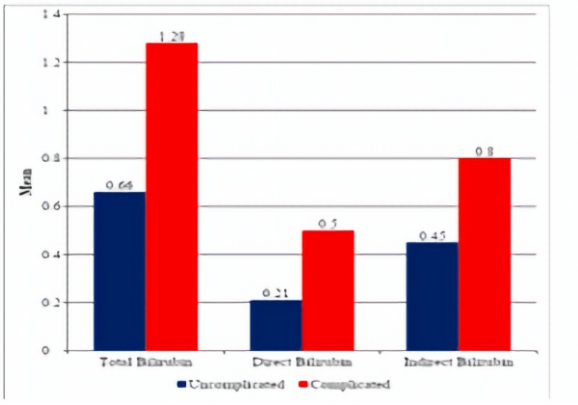


Figure 4: Comparison of Mean Serum Bilirubin Levels between Uncomplicated and Complicated Appendicitis

Table 5: Comparison of Liver Enzymes Between Groups

Parameter	Uncomplicated (Mean ± SD)	Complicated (Mean ± SD)	t value	P value
SGOT	42.78 ± 27.48	50.44 ± 26.49	-0.763	0.452
SGPT	35.08 ± 21.51	41.64 ± 21.73	-0.816	0.422
ALP	88.27 ± 18.99	108.12 ± 41.11	-1.688	0.103

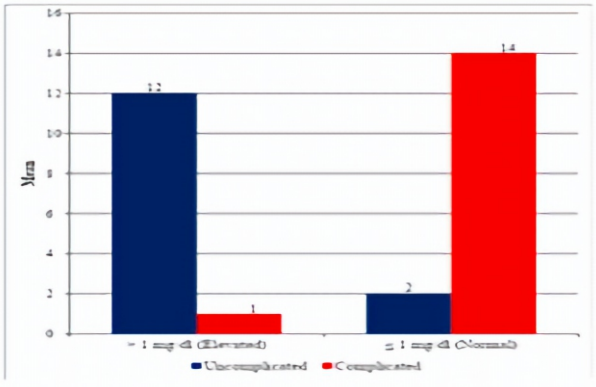


Figure 5: Association between Hyperbilirubinemia and Complicated Appendicitis

Table 6: Comparison of Hematological Parameters

Parameter	Uncomplicated (Mean ± SD)	Complicated (Mean ± SD)	t value	P value
Hemoglobin	11.85 ± 1.7	11.68 ± 1.61	0.2836	0.779
Platelets	2.29 ± 0.54	2.04 ± 1.26	0.7250	0.475
TLC	8914 ± 2404.72	12084.29 ± 4156.25	-2.536	0.158

DISCUSSION

The present study included 90 patients, with a mean age of 40.42 ± 14.16 years; the largest group was aged 31–40 years (30.0%). Males constituted 61.1% and females 38.9%. Bakshi and Mandal (2021) similarly reported male predominance (60%), although their population was younger, with a mean age of 23.5 years [5]. Akai et al. (2019) reported a mean age of 45.0 years.Such variation may reflect different eligibility criteria and referral patterns. These demographic distributions alone do not establish associations with hyperbilirubinemia or complications [15].

Leukocytosis occurred in 30.0%, whereas hyperbilirubinemia exceeding 1 mg/dL occurred in 17.8%, indicating that neither abnormality was consistently present. Emmanuel et al. (2011) supported bilirubin as an adjunct in assessing suspected appendicitis [16]. Sandstrom and Grieve (2017) reported higher specificity for bilirubin than leukocyte count or C-reactive protein. Nevertheless, higher specificity alone does not establish superior overall diagnostic performance [17].

Mean total bilirubin was higher in complicated than uncomplicated appendicitis, measuring 1.28 versus 0.66 mg/dL. Direct and indirect bilirubin also increased, suggesting a mixed biochemical pattern. Chaudhary et al. (2013) reported similar elevations in gangrenous or perforated appendicitis [18]. Bakshi and Mandal documented corresponding total bilirubin values of 1.39 and 0.79 mg/dL. These comparisons support an association with severity, although the inconsistent aggregate indirect bilirubin value in Table 9 requires verification [5].

Nomura et al. (2014) identified elevated bilirubin as a risk factor for gangrenous appendicitis, while Hong et al. (2012) demonstrated an association with perforation following multivariable analysis [19,20]. Akai et al. also identified hyperbilirubinemia, elevated C-reactive protein, and fever as predictors of complicated disease. Comparable independent predictive value cannot be assumed for the present study without adjustment for potential confounders [15].

Liver enzymes did not differ significantly between severity groups, consistent with Bakshi and Mandal. Haemoglobin and platelet values also showed limited separation. The biochemical pattern may reflect impaired bilirubin excretion rather than extensive hepatocellular injury, although this mechanism was not directly investigated. Mean leukocyte counts were higher in complicated cases, but the reported t statistic and p value require reconciliation before interpreting significance [5].

Provisional assessment identified seven complicated cases, whereas ultrasonography identified fourteen. Surgery confirmed complicated appendicitis in fourteen of twenty-nine operated patients; sixty-one patients received conservative management. These differing assessment pathways prevent direct conclusions about diagnostic agreement. Atema et al. (2015) supported combining clinical, laboratory, and imaging findings for severity assessment. Incomplete operative verification limits interpretation across the entire cohort [21].

Within operated patients, bilirubin achieved sensitivity of 85.7%, specificity of 93.3%, positive predictive value of 92.3%, negative predictive value of 87.5%, and accuracy of 89.7%. Kar et al. (2022) reported similar sensitivity (89.29%) but lower specificity (53.49%) [22]. Conversely, Muller et al. (2015) reported limited diagnostic accuracy. Variation in thresholds, selection, and complication prevalence may explain these differences. Overall, bilirubin appears useful as an adjunct, but the small verified subgroup and inconsistent statistical entries warrant cautious interpretation and further validation. Because the cohort lacked patients with alternative diagnoses, these findings primarily concern severity. Future studies should establish whether bilirubin adds predictive information beyond validated clinical scores and routinely available imaging [23].

CONCLUSION

The present study demonstrated an association between hyperbilirubinemia and complicated acute appendicitis, with higher total, direct, and indirect bilirubin levels in complicated cases. Serum bilirubin showed promising diagnostic performance within the operated subgroup and may provide supplementary information when interpreted alongside clinical assessment, inflammatory markers, and imaging. However, normal bilirubin levels did not exclude complications, and elevated levels alone could not establish the diagnosis. The small operated sample, incomplete outcome verification, and inconsistencies in reported data limit definitive conclusions. Larger prospective studies using standardised thresholds and consistent diagnostic criteria are required to validate bilirubin's additional value in assessing appendicitis severity.

LIMITATIONS & FUTURE PERSPECTIVES

The study's limitations include a single-centre setting, a relatively small sample size, and a short study duration, which may limit the broader applicability of the results. Future studies should incorporate multi-centre designs with larger populations to enhance validity, assess long-term outcomes, and investigate advanced diagnostic & management approaches. Such efforts will improve overall patient care & help minimize complications.

CLINICAL SIGNIFICANCE

The clinical significance of this study lies in its potential to bridge the gap between research findings and practical health-care, diagnosis, and treatment outcomes. By highlighting real-care applications. It emphasizes the importance of translating scientific observations into meaningful improvements in patient world

relevance, the study contributes to evidence based medical practice and supports informed clinical decision making. Ultimately, the findings aim to enhance patient quality of life, optimize therapeutic strategies, and promote better disease management in clinical settings.

ABBREVIATIONS

CRP: C-reactive protein
SPSS: Statistical Package for the Social Sciences
USG: Ultrasonography

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AUTHOR CONTRIBUTIONS

All authors significantly contributed to the study conception and design, data acquisition, or data analysis and interpretation. They participated in drafting the manuscript or critically revising it for important intellectual content, consented to its submission to the current journal, provided final approval for the version to be published, and accepted responsibility for all aspects of the work. Additionally, all authors meet the authorship criteria outlined by the International Committee of Medical Journal Editors (ICMJE) guidelines.

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CONFLICT OF INTEREST

Authors declared that there is no conflict of interest.

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ETHICAL APPROVAL & CONSENT TO PARTICIPATE

All necessary consent & approval was obtained by authors.

CONSENT FOR PUBLICATION

All necessary consent for publication was obtained by authors.

DATA AVAILABILITY

All data generated and analyzed are included within this research article. The datasets utilized and/or analyzed in this study can be obtained from the corresponding author upon a reasonable request.

USE OF ARTIFICIAL INTELLIGENCE (AI) & LARGE LANGUAGE MODEL (LLM)

The authors confirm that no AI & LLM tools were used in the writing or editing of the manuscript, and no images were altered or manipulated using AI & LLM.

AUTHOR'S NOTE

This article serves as an important educational tool for the scientific community, offering insights that may inspire future research diretions. However, they should not be relied upon independently when making treatment decisions or developing public health policies.

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REFERENCE

1. Moris D, Paulson EK, Pappas TN. Diagnosis and management of acute appendicitis in adults: a review. JAMA. 2021;326 (22):2299-2311. https://doi.org/10.1001/jama.2021.20502
2. Han H, Letourneau ID, Abate YH, Abdelmasseh M, Abu-Gharbieh E, Adane TD, et al. Trends and levels of the global, regional, and national burden of appendicitis between 1990 and 2021: findings from the Global Burden of Disease Study 2021. Lancet Gastroenterol Hepatol. 2024;9(9):825-858. https://doi.org/10.2139/ssrn.5112774
3. Guan L, Liu Z, Pan G, Zhang B, Wu Y, Gan T, et al. The global, regional, and national burden of appendicitis in 204 countries and territories, 1990–2019: a systematic analysis from the Global Burden of Disease Study 2019. BMC Gastroenterol. 20 23;23(1):1-13. https://doi.org/10.1186/s12876-023-02678-7

4. Salminen P, Haijanen J, Minneci PC, Davidson GH, Boermeester MA, Livingston E, et al. Appendicitis. Nat Rev Dis Primers. 2025;11(1):79-89. https://doi.org/10.1038/s41572-025-00659-6
5. Bakshi S, Mandal N. Evaluation of role of hyperbilirubinemia as a new diagnostic marker of complicated appendicitis. BMC Gastroenterol. 2021;21(1):1-16. https://doi.org/10.1186/s12876-021-01614-x
6. Skjold-Ødegaard B, Søreide K. The diagnostic differentiation challenge in acute appendicitis: how to distinguish between uncomplicated and complicated appendicitis in adults. Diagnostics (Basel). 2022;12(7):1-8. https://doi.org/10.3390/diagnostics12071724
7. Gogoi B, Gautam A. A clinical study on appendicular perforation and its management. J Recent Adv Appl Sci. 2025;40:1-8.
8. Echevarria S, Rauf F, Hussain N, Zaka H, Ahsan N, Broomfield A, et al. Typical and atypical presentations of appendicitis and their implications for diagnosis and treatment: a literature review. Cureus. 2023;15(4):1-12. https://doi.org/10.7759/cureus.37024
9. Saket R, Dutt C, Chandel H, Dutt T. A prospective study of clinical profile of acute appendicitis and its correlation with ultrasonography findings in patients admitted in JA Group of Hospitals, Gwalior. J Recent Adv Appl Sci. 2026;41:1-8. https://doi.org/10.71393/h9s6ew55
10. Podda M, Ceresoli M, De Simone B, Fugazzola P, Pata F, Balla A, et al. Diagnosis and treatment of acute appendicitis: 2025 edition of the World Society of Emergency Surgery Jerusalem guidelines. JAMA Surg. 2026;161(3):283-295. https://doi.org/10.1001/jamasurg.2025.6218
11. Acharya A, Markar SR, Ni M, Hanna GB. Biomarkers of acute appendicitis: systematic review and cost-benefit trade-off analysis. Surg Endosc. 2017;31(3):1022-1031. https://doi.org/10.1007/s00464-016-5109-1
12. Blond K, Haler D. The liver: porta malorum (the gateway to disease). Butterworth-Heinemann; 2016.
13. Alfehaid MS, Babiker AM, Alkharraz AH, Alsaeed HY, Alzunaydi AA, Aldubaiyan AA, et al. Elevated total and direct bilirubin are associated with acute complicated appendicitis: a single-center based study in Saudi Arabia. BMC Surg. 2023;23(1):1-7. https://doi.org/10.1186/s12893-023-02258-2
14. Gavriilidis P, de'Angelis N, Evans J, Di Saverio S, Kang P. Hyperbilirubinemia as a predictor of appendiceal perforation: a systematic review and diagnostic test meta-analysis. J Clin Med Res. 2019;11(3):171-178. https://doi.org/10.14740/jocmr3724
15. Akai M, Iwakawa K, Yasui Y, Yoshida Y, Kato T, Kitada K, et al. Hyperbilirubinemia as a predictor of severity of acute appendicitis. J Int Med Res. 2019;47(8):3663-3669. https://doi.org/10.1177/0300060519856155
16. Emmanuel A, Murchan P, Wilson I, Balfe P. The value of hyperbilirubinaemia in the diagnosis of acute appendicitis. Ann R Coll Surg Engl. 2011;93(3):213-217. https://doi.org/10.1308/147870811x566402
17. Sandstrom A, Grieve DA. Hyperbilirubinaemia: its utility in non-perforated appendicitis. ANZ J Surg. 2017;87(7-8):587-590. https://doi.org/10.1111/ans.13373
18. Chaudhary P, Kumar A, Saxena N, Biswal UC. Hyperbilirubinemia as a predictor of gangrenous/perforated appendicitis: a prospective study. Ann Gastroenterol. 2013;26(4):325-331.
19. Nomura S, Watanabe M, Komine O, Shioya T, Toyoda T, Bou H, et al. Serum total bilirubin elevation is a predictor of the clinicopathological severity of acute appendicitis. Surg Today. 2014;44(6):1104-1108. https://doi.org/10.1007/s00595-013-0659-5
20. Hong YR, Chung CW, Kim JW, Kwon CI, Ahn DH, Kwon SW, et al. Hyperbilirubinemia is a significant indicator for the severity of acute appendicitis. J Korean Soc Coloproctol. 2012;28(5):247-252. https://doi.org/10.3393/jksc.2012.28.5.247
21. Atema JJ, van Rossem CC, Leeuwenburgh MM, Stoker J, Boermeester MA. Scoring system to distinguish uncomplicated from complicated acute appendicitis. Br J Surg. 2015;102(8):979-990. https://doi.org/10.1002/bjs.9835
22. Kar S, Behera TK, Jena K, Sahoo AK, Behera T, Jena SK. Hyperbilirubinemia as a possible predictor of appendiceal perforation in acute appendicitis: a prospective study. Cureus. 2022;14(2):1-8. https://doi.org/10.7759/cureus.21851
23. Muller S, Falch C, Axt S, Wilhelm P, Hein D, Königsrainer A, et al. Diagnostic accuracy of hyperbilirubinaemia in anticipating appendicitis and its severity. Emerg Med J. 2015;32(9):698-702. https://doi.org/10.1136/emermed-2013-203349

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