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Significance of liver function test to assess the diagnosis and the severity of acute appendicitis and predicting complications

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ABSTRACT

Background: One of the most common surgical emergencies that happens in the abdomen is the acute appendicitis. According to the research, liver function tests (LFT) may be utilized to predict the severity of appendicitis and serve as a marker for acute appendicitis.

Methods: From January to June 2024, 100 cases of acute appendicitis were observed in the emergency room of "Azadi Teaching Hospital," located in Duhok City, Kurdistan region, Iraq, as part of a single-center, observational, prospective study. The Research Ethics Committee granted ethical permission (Ref. No. 29112023-10-8). Every patient had blood testing, including liver function tests as well as abdominal ultrasonography. Reports on histopathological findings were also examined. Patients with uncomplicated and complicated appendicitis (perforated, gangrenous) were split into two groups. Microsoft Excel 2020 was used to collect and statistically evaluate the data.

Results: Among the 100 patients, 54% were male, while 46% were female. Negative appendectomies were found in 2% of cases. Elevated total bilirubin levels were found in 71% of patients with an uncomplicated appendicitis and 89% of those with complicated appendicitis, yielding a significant p-value of 0.0053 and a sensitivity of 62%. Direct bilirubin was elevated in 88% of cases of uncomplicated appendicitis and 96% in complicated cases, with a significant p-value of 0.05 and a sensitivity of 69%. Both alanine transaminase (ALT)and aspartate transaminase (AST) levels were increased in both groups, especially in the complicated group, with AST elevated in 53% of cases and ALT in 35%. Alkaline phosphatase (ALP) levels were raised in 81% of uncomplicated appendicitis and 82% of complicated appendicitis cases, showing a sensitivity of 70.5%.

Conclusion: In summary, liver function tests (LFT) can assist in diagnosing, evaluating the severity, and predicting complications of acute appendicitis by showing increases in total bilirubin, direct bilirubin, and alkaline phosphatase.

Keywords: *Complications, LFT, Appendicitis.*

1. INTRODUCTION

Acute appendicitis is a frequent surgical emergency marked by the clinical symptom of migrating abdominal pain, usually manifesting in the right lower quadrant, which necessitates prompt diagnosis and referral to a secondary care facility, particularly in unusual patient demographics.1

Diagnosis chiefly depends on clinical assessment, as imaging and biomarkers present certain limitations. 2

This condition mainly affects younger adults, with a significant prevalence in males. 3

Several scoring systems that integrate clinical signs and laboratory tests have been created to establish the diagnosis; however, no definitive laboratory markers exist for the preoperative identification of acute appendicitis or its complications (like perforation). 6

Elevated serum bilirubin levels, especially direct bilirubin, have been recognized as a potential marker for acute appendicitis, demonstrating a positive predictive value of 96.55% for hyperbilirubinemia. 4

In cases of complicated appendicitis, particularly perforated appendicitis, elevated total bilirubin levels have exhibited 100% sensitivity and 75% specificity, indicating their usefulness as an indicator of perforation. 5

Simple or uncomplicated appendicitis can be described as an inflamed appendix that is phlegmonous without signs of necrosis or perforation. On the other hand, complicated appendicitis is defined by focal or transmural necrosis, which may eventually result in perforation.

Imaging techniques, such as CT scans, are a dependable diagnostic tool, though they have drawbacks including increased radiation exposure and cost. 7

Consequently, there is significant interest in finding alternative diagnostic methods to evaluate the severity of acute appendicitis before relying on radiological assessments. 8

An affordable biochemical test, like a liver function test that may be specifically indicative of acute appendicitis, could complement clinical findings in predicting the diagnosis of appendicitis or appendicitis with complications. 9,10

During appendicitis, bacteria can migrate into the portal vein, reaching the liver, where they are cleared by the reticuloendothelial system to a certain threshold. If the bacterial load exceeds the liver's-controlled limits, it results in parenchymal damage and prompts the release of cytokines such as TNF and IL-6, disrupting bile excretion physiology, which leads to hyperbilirubinemia and liver function abnormalities.11

Aims and objectives

To analyze the role of LFT parameters in predicting acute appendicitis and its severity.

2. METHODS

This study has followed a single-center, observational prospective study among 100 cases of acute appendicitis. The study was Conducted in an emergency department at "Azadi Teaching Hospital" that located in Duhok City, Kurdistan region, Iraq. From January 2024 to June 2024. Ethical approval has taken from the Research Ethics Committee (Ref. No. 29112023-10-8).

Inclusion criteria

1. Ages between 16 -75.
2. All operated on patients of acute appendicitis with completed medical records.

Exclusion criteria

1 . Those with incomplete medical records

2 . Children below 14 years

3. Patients with documented biliary, hemolytic, or liver disease.

After obtaining informed consent from each patient, all patients included in the study underwent routine blood investigations, including LFT and abdominal ultrasound. Intraoperative and histopathologically findings were collected after appendectomy.

Patients with histopathology reports positive for inflamed appendices were divided into two groups: uncomplicated and complicated appendicitis.

3. RESULTS

Table 1: Gender based case divisions

Gender	Number of cases	percentage
Male	54	54
Female	46	46

Table 1 shows that out of the 100 cases, 54% were male and 46% were female.

Table 2: Age-based case distribution

Age group	Number of cases	Percentage
>16	**22**	**22**
20-29	**42**	**42**
30-39	**13**	**13**

40-49	**13**	**13**
>50	**10**	**10**

Of the 100 cases, 2 (4%) were negative appendectomies

The 98 cases of the inflamed appendix, 70 (71%) had uncomplicated appendicitis, while 28 (28%) had complicated(gangrenous or perforated) appendicitis

Table 3: Connection between appendicular pathology and total bilirubin

Total bilirubin,	**uncomplicated,**	**complicated Appendicitis,**	**total Appendicitis**
Elevated	**50**	**25**	**75**
Normal 20	**3**	**23**	

P value =0.0053 (significant).

In a study involving 98 cases of inflamed appendix, 75 cases (76%) exhibited increased levels of total bilirubin, while 23 cases (23%) showed normal levels. Among the 70 cases of uncomplicated appendicitis, 50 cases (51%) had elevated total bilirubin levels, and 20 cases (20%) maintained normal total bilirubin levels. In the subset of 28 cases with perforated appendices, 25 cases (89%) presented with elevated total bilirubin levels, and 3 cases (11%) had normal total bilirubin levels.

Table 4: Connection between appendicular pathology and direct bilirubin

Direct	**uncomplicated,**	**complicated**	**total bilirubin**	**Appendicitis**	**Appendicitis**
Elevated	**62**	**27**	**91**		
Normal 8	**1**	**9**			

Out of the 98 cases of inflamed appendix, 89 cases (90%) showed increased levels of direct bilirubin, whereas 9 cases (9%) demonstrated normal values. Of the 70 cases of uncomplicated appendicitis, 62 cases (88%) had elevated direct bilirubin, and 8 cases (11%) showed normal direct bilirubin levels. In the 28 complicated appendix cases, 27 cases (96%) had elevated direct bilirubin levels, with only 1 case (3%) displaying normal direct bilirubin levels.

Table 5: Link between appendicular pathology and AST (SGOT)

AST	**uncomplicated**	**complicated**	**total Appendix**	**Appendix**
Elevated	**15**	**15**	**30**	
Normal 55	**13**	**68**		

Among the 98 cases of inflamed appendix, 30 cases (31%) registered elevated AST levels, while 68 cases showed normal levels. In the group of 70 cases of uncomplicated appendicitis, 15 cases (21%) presented with elevated AST levels, and 55 cases (78%) had normal AST levels. Of the 28 complicated appendicitis cases, 15 cases (53.5%) exhibited elevated AST levels, while 13 cases (46.5%) had normal AST levels.

Table 6: Connection between appendicular pathology and ALT (SGPT)

ALT Appendix	uncomplicated Appendix	complicated	total
Elevated	7	10	17
Normal 63	18	81	

From the total of 98 cases, 16 cases (16.2%) showed elevated ALT levels, and 82 cases (82.8%) had normal ALT levels. Within the 70 cases of inflamed appendix, 7 cases (9%) had increased ALT levels, while 63 cases (93%) displayed normal ALT levels. Of the 28 complicated appendicitis cases, 10 cases (35%) reported elevated ALT levels, and 18 cases (64%) had normal ALT levels.

Table 7: Connection between appendicular pathology and alkaline phosphate

Alkaline	uncomplicated	complicated	total Phosphatase	Appendix	Appendix
Elevated	57	23	70		
Normal 13	5	18			

Among the 98 cases of inflamed appendix, 80 cases (81.25%) had elevated ALP levels, while 18 cases (18.75%) maintained normal ALP levels. In the cohort of 70 patients with uncomplicated appendicitis, 57 cases (82%) exhibited elevated ALP levels, and 13 cases (18%) had normal ALP levels. From the 28 cases of complicated appendicitis, 23 cases (82%) showed elevated ALP levels, and 5 cases (18%) had normal ALP levels.

4. DISCUSSION

This discussion section has been discussed prospective of 100 patients; based on the connection between appendicitis and LFT parameters. Among the 100 cases, the researcher has found 98 patients (98%) have appendix were an inflamed and normal appendix cases were 2 patients (2%). Thereafter, this study has found among the 98 inflamed appendix patients, 76% were having elevated total bilirubins level. Moreover, among the 70 uncomplicated appendix cases, 60% has elevated a total bilirubin; and among the 28 complicated appendicitis 89% has found total bilirubin with the P-value of 0.0053 (sig. value)

Our findings align with a study by Mishra et al, which reported that 53.3% of all cases of inflamed appendices exhibited increased total bilirubin levels. Among complicated appendicitis cases, 81.25% had elevated total bilirubin levels, while 21.42% of uncomplicated appendicitis cases showed similar results. 11

Our findings surpass those of Yadav et al, where only 36.25% of total cases displayed elevated total bilirubin levels. 7

In contrast, a study by Khan et al. noted that 86.6% of the total cases had increased total bilirubin levels.

In this study, 89 out of 98 cases of inflamed appendices (90%) demonstrated elevated direct bilirubin levels. Of the 70 patients with uncomplicated appendicitis, 62 (88%) had raised direct bilirubin levels, whereas, among the 28 complicated cases, 27 (96%) had elevated direct bilirubin levels.

Once again, our results are comparable to those of Yadav et al, where direct bilirubin was increased in 90% of the cases. A study by Khan et al. found that serum bilirubin was raised in 86% of cases with predominantly conjugated hyperbilirubinemia 12

In the current study, 30 out of 98 patients (31%) had elevated AST levels. Among the 70 patients with uncomplicated appendicitis, 15 cases (15%) had elevated AST levels, while 15 out of 28 cases (53%) of complicated appendicitis showed elevated AST levels.

These results are similar to those of Mishra et al, who reported that 28% of inflamed appendix cases had elevated AST, with 50% of complicated appendicitis cases also showing elevated AST. 11

A study by Yadav et al indicated that 28.75% of patients had elevated AST, and another study by Khan et al presented that

38.7% of patients had increased AST levels.12

In this study, 17 out of 98 patients (17.1%) exhibited elevated ALT levels. Of the 70 inflamed appendix cases, only 7 cases (7%) showed elevated ALT levels, while among the 28 perforated appendix cases, 10 patients (35%) had elevated ALT levels.

According to Mishra et al, 8.3% of total cases had raised ALT levels, with 15.6% of complicated appendices reporting elevated levels. 11

Yadav et al found that 32.5% of cases demonstrated increased ALT levels, whereas a study by Khan et al indicated that 26.54% of cases had elevated ALT levels.12

In this study, 80 out of 98 patients (81.25%) had elevated ALP levels. Among the 70 inflamed appendicitis cases, 57 (81%) had elevated ALP levels, while 82% of the 28 perforated appendix cases also showed increased ALP levels.

Mishra et al reported that 10% of all cases exhibited elevated ALP levels, with 18.75% of complicated appendices showing increased levels. 11

In Yadav et al's study, 82.5% of cases had elevated ALP levels, while Khan et al's research indicated that 48.97% of cases showed increased ALP levels. 12

5. CONCLUSION

The LFT can easily be useful in case of diagnosis, to predict different complications of acute appendicitis. Elevations of all of the direct bilirubin, total bilirubin, and alkaline phosphatase levels appear to be the most useful (amongst the LFT parameters) in predicting different complications

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Data Availability: The datasets used during the current study are available from the corresponding author upon reasonable request.

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