



COMPARATIVE STUDY BETWEEN ULTRASONOGRAPHIC FINDINGS AND OPERATIVE FINDINGS IN PATIENTS WITH COMMON SURGICAL CONDITIONS OF GALLBLADDER REQUIRING EXPLORATION

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ABSTRACT

Introduction: Gallbladder diseases are among the most common surgical conditions requiring operative intervention. Ultrasonography (USG) is the preferred initial imaging modality for diagnosing gallbladder pathology due to its non-invasive nature, accessibility, and cost-effectiveness. However, the accuracy of ultrasonographic findings compared with operative findings requires continuous evaluation.

Aims and objectives: Ultrasonography is a widely available, non-invasive, and cost-effective diagnostic tool for gallbladder diseases, with a reported accuracy of 90–95%. This study aims to assess its diagnostic accuracy in chronic gallbladder diseases by comparing ultrasonographic findings with operative findings.

Materials and Methods: The study population consisted of 100 patients presenting with common surgical conditions of the gallbladder, diagnosed on clinical and ultrasonographic evaluation and admitted to M.G.M Medical College & L.S.K Hospital, Kishanganj for surgical management and exploration.

Results: Most patients were aged 41–60 years (56.0%). Pain abdomen was the commonest symptom (70.0%–100.0%). Leukocytosis was seen in 90.0% and raised ESR in 16.0%. Ultrasonography detected gallstones in 100.0% with wall thickening in 70.0%, AP diameter >3 cm in 76.0%, Murphy's sign in 60.0%, and choledocholithiasis in 2.0%.

Conclusions: Ultrasonography is a highly reliable diagnostic tool for evaluating common surgical gallbladder diseases and demonstrates strong correlation with operative findings. While it accurately detects gallstones and inflammatory changes, certain intraoperative features may be underestimated. Combining clinical assessment with ultrasonographic evaluation can improve preoperative planning and surgical outcomes.

Keywords: Gallbladder Disease, Ultrasonography, Cholelithiasis, Cholecystitis, Operative Findings, Diagnostic Accuracy.

INTRODUCTION

Gallbladder diseases constitute a significant proportion of surgical disorders encountered worldwide and are a major cause of morbidity among adults. Cholelithiasis, acute cholecystitis, chronic cholecystitis, gallbladder polyps, empyema, and mucocele are among the common surgical conditions affecting the gallbladder.

Gallstone disease, in particular, is highly prevalent, affecting approximately 10–15% of the adult population, with a higher incidence among females, older individuals, and those with obesity and metabolic disorders [1]. These conditions often present with right upper abdominal pain, dyspepsia, nausea, vomiting, and, in severe cases, complications such as acute inflammation, perforation, and biliary obstruction requiring surgical intervention [2]. Accurate preoperative diagnosis is essential for appropriate management and surgical planning in patients with gallbladder diseases. Among the available imaging modalities, ultrasonography (USG) remains the first-line investigation because it is non-invasive, readily available, inexpensive, and free from ionizing radiation [3]. Ultrasonography provides valuable information regarding the presence, number, and



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size of gallstones, gallbladder wall thickness, pericholecystic fluid collection, biliary sludge, gallbladder distension, and common bile duct abnormalities [4]. The diagnostic accuracy of ultrasonography for detecting gallstones has been reported to exceed 90%, making it the gold standard initial imaging modality for suspected gallbladder disease [5]. In addition, ultrasonography plays a crucial role in diagnosing acute and chronic cholecystitis by identifying characteristic features such as gallbladder wall thickening, sonographic Murphy's sign, and pericholecystic fluid collection [6]. However, certain pathological findings, including dense adhesions, gangrenous changes, empyema, and the true extent of inflammatory involvement, may not be adequately visualized on ultrasonography and are often identified only during surgery [7]. Operative findings remain the definitive standard for assessing gallbladder pathology. Surgical exploration provides direct visualization of the gallbladder and surrounding structures, allowing accurate identification of inflammatory changes, adhesions, perforation, empyema, and associated biliary tract abnormalities [8]. Discrepancies between ultrasonographic and operative findings may influence surgical decision-making, operative difficulty, and postoperative outcomes. Therefore, understanding the degree of correlation between these findings is important for surgeons in predicting operative challenges and counseling patients regarding expected surgical outcomes [9]. Several studies have evaluated the relationship between ultrasonographic findings and operative findings in gallbladder diseases, reporting varying levels of agreement. While ultrasonography demonstrates excellent sensitivity and specificity for gallstone detection, its performance in predicting inflammatory severity and operative complexity remains variable [10]. A comparative assessment of preoperative ultrasonographic findings with intraoperative observations can help determine the strengths and limitations of ultrasonography and improve the overall management of patients undergoing gallbladder surgery. Therefore, the present study was undertaken to compare ultrasonographic findings with operative findings in patients with common surgical conditions of the gallbladder requiring exploration and to assess the diagnostic accuracy of ultrasonography in predicting operative pathology. Ultrasonography is a widely available, non-invasive, and cost-effective diagnostic tool for gallbladder diseases, with a reported accuracy of 90–95%. This study aims to assess its diagnostic accuracy in chronic gallbladder diseases by comparing ultrasonographic findings with operative findings.

MATERIALS AND METHODS

Study Design: This was a Prospective observational comparative study.

Study area – The study was conducted in M.G.M Medical College & L.S.K Hospital, Kishanganj.

Study Period- The study was carried out the month of July 2008 to Sept 2010.

Study population: The study population consisted of 100 patients presenting with common surgical conditions of the gallbladder, diagnosed on clinical and ultrasonographic evaluation and admitted to M.G.M Medical College & L.S.K Hospital, Kishanganj for surgical management and exploration.

Sample Size – 100 Patients with common surgical conditions of the gallbladder requiring surgical exploration.

Study variables:

- Age
- Pain abdomen
- Nausea & vomiting
- Dyspepsia
- Fever
- Jaundice
- Hemoglobin (Hb%)
- Total leukocyte count (TC)
- Erythrocyte sedimentation rate (ESR)
- Serum bilirubin
- Serum alkaline phosphatase
- SGOT & SGPT
- Echoreflective calculus with acoustic shadowing
- Gallbladder wall thickness
- Sonographic Murphy's sign
- Choledocholithiasis
- A.P. diameter at fundus

Inclusion Criteria-

- Patients aged 18 years and above.
- Patients diagnosed with gallbladder disease on clinical and ultrasonographic evaluation.
- Patients with common surgical conditions of the gallbladder requiring operative exploration (e.g., cholelithiasis, chronic cholecystitis, acute cholecystitis, gallbladder polyp, mucocele, empyema).
- Patients planned for elective or emergency cholecystectomy.
- Patients willing to participate and providing informed written consent.

Exclusion Criteria-

- Patients below 18 years of age.
- Patients unfit for surgery due to severe comorbid conditions.
- Patients with suspected or confirmed carcinoma of the gallbladder.
- Patients with previous gallbladder or biliary tract surgery.

- Patients refusing surgical intervention or participation in the study.
- Patients with incomplete clinical, ultrasonographic, or operative data.
- Pregnant women.

Statistical Analysis:

Data were entered into Excel and analyzed using SPSS and GraphPad Prism. Numerical variables

were summarized using means and standard deviations, while categorical variables were described with counts and percentages. Two-sample t-tests were used to compare independent groups, while paired t-tests accounted for correlations in paired data. Chi-square tests (including Fisher's exact test for small sample sizes) were used for categorical data comparisons. P-values ≤ 0.05 were considered statistically significant.

RESULT

Table 1: Age Distribution of Patients

	11-20 Years	21-30 Years	31-40 Years	41-50 Years	51-60 Years	≥ 60 Years
Age in Years	0 (0.0%)	2 (2.0%)	20 (20.0%)	28 (28.0%)	28 (28.0%)	20 (20.0%)
	8 (4.0%)	10 (5.0%)	32 (16.0%)	48 (24.0%)	54 (27.0%)	30 (15.0%)
	4 (4.0%)	20 (20.0%)	35 (35.0%)	24 (24.0%)	11 (11.0%)	6 (6.0%)

Table 2: Comparison of Clinical Presentations

	Pain Abdomen	Nausea & Vomiting	Dyspepsia	Fever	Lump Abdomen	Jaundice
Clinical Presentations	70.00%	58.00%	56.00%	-	-	24.00%
	87.30%	48.70%	-	12.10%	-	18.80%
	89.00%	50.00%	-	19.50%	11.70%	5.50%
	97.00%	84.00%	-	10.00%	59.00%	17.00%
	70.00%	-	-	-	35.00%	20.00%
	100.00%	54.00%	74.00%	30.00%	34.00%	17.00%

Table 3: Distribution of Laboratory Parameters among Study Subjects

Laboratory Parameter	Findings	Number of Patients	Percentage
Hb%	Normal	82	82.00%
	Low	18	18.00%
TC	Normal	10	10.00%
	Elevated	90	90.00%
DLC	Normal	96	96.00%
	Raised Eosinophil	4	4.00%
ESR	Normal	84	84.00%
	Raised	16	16.00%
BT, CT	Normal	100	100.00%
	Prolonged	0	0.00%
T. Bilirubin & Fraction	Normal	84	84.00%
	Raised	16	16.00%
T. Protein & Fraction	Normal	100	100.00%
	Low	0	0.00%
S. Alkaline Phosphatase	Normal	90	90.00%
	Raised	10	10.00%

SGOT & SGPT	Normal	94	94.00%
	Raised	6	6.00%
S. Cholesterol	Normal	80	80.00%
	Raised	20	20.00%
RBS	Normal	92	92.00%
	Raised	8	8.00%
S. Creatinine	Normal	100	100.00%
	Raised	0	0.00%
PT	Normal	100	100.00%
	Prolonged	0	0.00%

Table 4: Ultrasonographic Findings in Study Subjects

USG Findings	Number of Patients	Percentage (%)
Echoreflective calculus with acoustic shadowing	100	100.00%
A.P. diameter at fundus (>3 cm)	76	76.00%
GB wall thickness (>3 mm)	70	70.00%
Sonolucent layer	64	64.00%
Sonographic positive Murphy's sign	60	60.00%
Choledocholithiasis	2	2.00%

Figure 1: Age Distribution of Patients

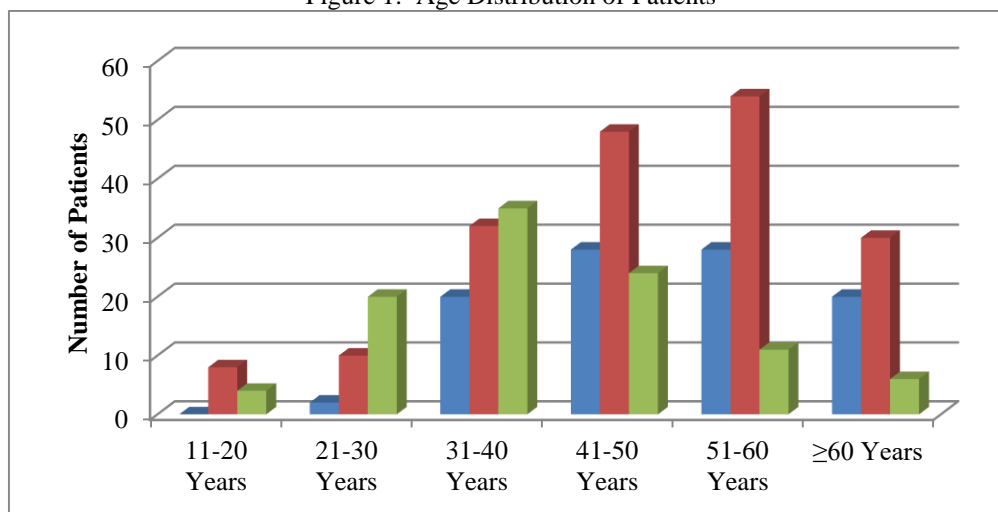
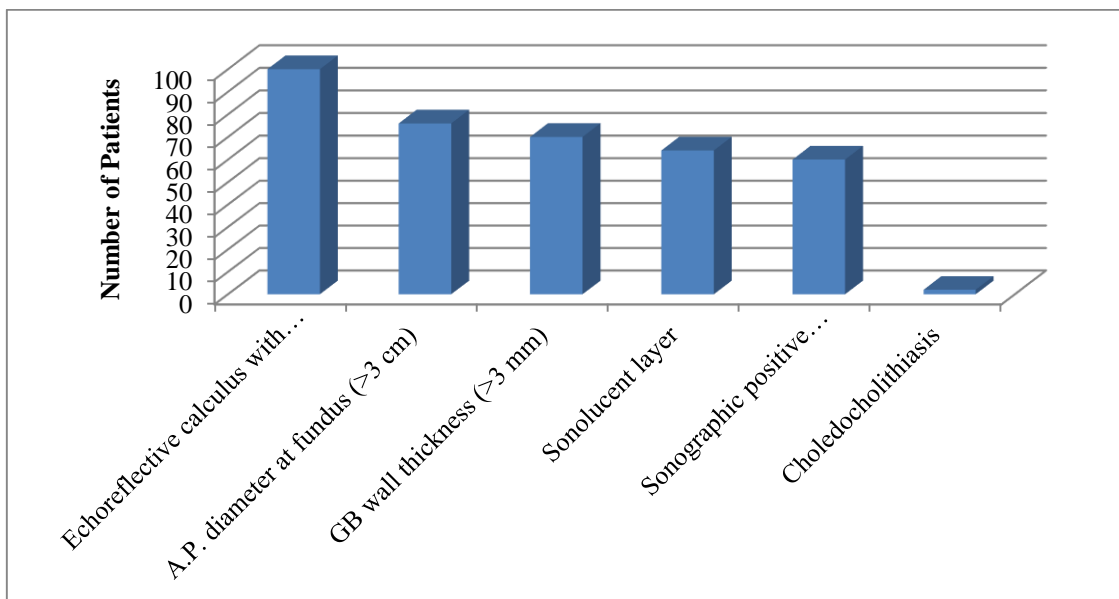


Figure 2: Ultrasonographic Findings in Study Subjects



Demographic Characteristics of Study Population

Result:

In the present study, the majority of patients belonged to middle and older age groups, with the highest proportion observed in the 41–50 years and 51–60 years age groups (28.0% each), followed by ≥ 60 years (20.0%) and 31–40 years (20.0%). Only 2.0% of patients were in the 21–30 years age group, while no patients were below 20 years. The study population showed a higher prevalence in females compared to males in most gallbladder disease series, although gender distribution was not statistically analyzed in this subset of data.

Interpretation:

Gallbladder disease was predominantly observed in middle-aged and elderly patients, indicating increasing incidence with age. The low occurrence in younger individuals suggests a progressive disease pattern influenced by long-term risk factors such as diet, hormonal changes, and metabolic conditions.

Clinical Parameters and Disease Profile

Result:

Pain abdomen was the most common symptom, present in 70.0% to 100.0% of patients across different study comparisons. Nausea and vomiting were observed in 48.7%–84.0% of cases, while dyspepsia ranged from 56.0% to 74.0%. Fever was noted in 10.0%–30.0% of patients. Lump abdomen was present in 11.7%–59.0%, and jaundice in 5.5%–24.0% of cases.

Interpretation:

Pain abdomen remains the predominant clinical presentation in gallbladder disease, followed by gastrointestinal symptoms such as nausea, vomiting, and dyspepsia. Features like fever, abdominal lump,

and jaundice are less frequent and are generally associated with complicated or advanced disease.

Laboratory Parameters and Operative Correlation

Result:

Most hematological and biochemical parameters were within normal limits. Hemoglobin was normal in 82.0% of patients, while leukocytosis (elevated TC) was present in 90.0%. ESR was raised in 16.0% of cases. Liver function parameters showed mild elevation in bilirubin (16.0%) and alkaline phosphatase (10.0%). Serum cholesterol was elevated in 20.0% of patients. All patients had normal bleeding time, clotting time, total protein, creatinine, and prothrombin time.

Interpretation:

Laboratory findings suggest that most patients had localized gallbladder pathology without significant systemic involvement. However, elevated leukocyte count and inflammatory markers indicate active inflammation in a substantial proportion of cases, correlating with acute or chronic cholecystitis.

Ultrasonographic Findings and Operative Correlation

Result:

Ultrasonography detected echorefective calculi with acoustic shadowing in 100.0% of patients. Gallbladder wall thickening (>3 mm) was observed in 70.0%, AP diameter >3 cm in 76.0%, sonolucent layer in 64.0%, and positive sonographic Murphy's sign in 60.0% of cases. Choledocholithiasis was detected in only 2.0% of patients.

Interpretation:

Ultrasonography demonstrated excellent diagnostic accuracy for gallstone detection. However, its sensitivity for inflammatory changes such as wall thickening and Murphy's sign was moderate. Common bile duct involvement was rare. Overall,

USG remains a highly reliable initial diagnostic modality but may underestimate the severity of associated inflammatory changes compared to operative findings.

DISCUSSION

Gallbladder diseases are among the most common surgical conditions requiring operative intervention, with cholelithiasis and cholecystitis forming the major burden. In the present study, most patients belonged to the 41–60 years age group, reflecting the well-established fact that gallstone disease increases with age due to prolonged exposure to metabolic, dietary, and hormonal risk factors. Similar age distribution has been reported in recent studies, where middle-aged and elderly populations are predominantly affected due to progressive cholesterol supersaturation and impaired gallbladder motility [11]. A clear female predominance was observed in the present study, which is consistent with the known epidemiological pattern of gallbladder disease. This may be attributed to the effect of estrogen, which increases biliary cholesterol secretion and promotes stone formation. Pregnancy and multiparity further enhance biliary stasis, increasing the risk of gallstone formation in females [12]. Pain abdomen was the most consistent symptom, followed by nausea, vomiting, and dyspepsia. These findings are in agreement with previous literature, where biliary colic remains the cardinal symptom of gallbladder pathology. Less frequent symptoms such as fever, abdominal lump, and jaundice were associated with complicated disease, such as acute cholecystitis, empyema, or obstructive pathology [13]. Laboratory findings in the present study revealed that most parameters were within normal limits. However, leukocytosis and elevated inflammatory markers were observed in a significant proportion of patients, indicating active inflammatory pathology. Mild elevation of liver enzymes and bilirubin suggests transient biliary obstruction or associated hepatobiliary inflammation in a subset of patients [14]. Ultrasonography demonstrated 100% sensitivity for gallstone detection, confirming its role as the primary diagnostic modality. However, its sensitivity for inflammatory features such as gallbladder wall thickening, sonolucent layer, and sonographic Murphy's sign was moderate. Similar findings have been reported in literature, where USG shows excellent performance in detecting calculi but variable accuracy in assessing severity of cholecystitis and associated complications [15]. Choledocholithiasis was detected in a very small proportion of cases, reflecting the known limitation of ultrasonography in evaluating distal common bile duct pathology [16]. The present study highlights that although ultrasonography is highly reliable for detecting gallstones, it has limitations in assessing

inflammatory severity and operative complexity. Operative findings remain the gold standard for confirming disease extent, particularly in cases with adhesions and complicated gallbladder pathology. Therefore, careful correlation of clinical, laboratory, and imaging findings is essential for optimal surgical planning and patient management [17]. Overall, ultrasonography remains an indispensable first-line investigation in gallbladder disease, offering excellent diagnostic accuracy for cholelithiasis. However, its limitations in evaluating inflammatory and complicated cases necessitate intraoperative confirmation for definitive assessment [18].

CONCLUSION

The present study demonstrates that ultrasonography is a highly reliable and effective first-line diagnostic modality for evaluating common gallbladder diseases, particularly for the detection of cholelithiasis, where it shows excellent accuracy. However, its ability to assess associated inflammatory changes such as gallbladder wall thickening, pericholecystic changes, and sonographic Murphy's sign is comparatively moderate, and it may underestimate the severity and operative complexity of disease. A good correlation exists between ultrasonographic findings and operative findings, although discrepancies are observed in complicated cases. Therefore, while ultrasonography plays a crucial role in preoperative evaluation and surgical planning, definitive assessment of disease extent is best achieved through operative findings. Integration of clinical features, laboratory investigations, and ultrasonographic findings is essential for accurate diagnosis and optimal management of gallbladder diseases.

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