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Original Research Article

Comparative Study of Clinical Profile in Patients With Solitary vs Multiple Gallstones

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Abstract: *Gallstones are a common biliary pathology, posing a significant global health burden. The worldwide prevalence of gallstones is approximately 10-15% among adults, with higher rates reported in developed countries due to dietary habits and lifestyle factors1. In developing nations, including Pakistan, the prevalence of gallstone disease ranges between 15% and 20% with a higher occurrence in females compared to males.* ***Objective:*** *To compare the clinical profiles of patients with solitary gallstones versus those with multiple gallstones in a Pakistani population. Study design: Prospective observational study. Place and duration: Department of General Surgery, Combined Military Hospital, Hyderabad, for 6 months, i.e., from Oct/2024 till March/2025.* ***Methods:*** *A total of 141 patients who fulfilled the selection criteria were included. Patients were divided into two groups based on the number of stones in the gallbladder as revealed on ultrasonography, i.e., Group A (solitary gallstones; n=71) and Group B (multiple gallstones; n=70). All patients underwent laparoscopic cholecystectomy, and outcomes were assessed and subjected to statistical analysis.* ***Results:*** *The median (IQR) age of patients in Group A was 45 (13) years, and in Group B was 42 (13) years (p=0.601). The median (IQR) intraoperative duration in Group A was 42 (4) minutes and in Group B was 41 (7) minutes (p=0.016). The median (IQR) duration of stay at the hospital was 6 (2) days in Group A and 4 (1) days in Group B (p=0.000). Pain was the commonest symptom in both groups, and there was no significant difference in terms of clinical presentation between the two.* ***Conclusion:*** *In patients with gallstones, there was no significant difference in the clinical presentations of multiple versus solitary gallstones; however, there was a significant difference in terms of intraoperative duration, intraoperative findings, and duration of hospitalization.*

Keywords: Clinical presentation, Gallstone, multiple, solitary

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Introduction

Gallstones are a common biliary pathology, posing a significant global health burden. The worldwide prevalence of gallstones is approximately 10-15% among adults, with higher rates reported in developed countries due to dietary habits and lifestyle factors (1). In developing nations, including Pakistan, the prevalence of gallstone disease ranges between 15% and 20% with a higher occurrence in females compared to males (2). Urban areas in Pakistan report even higher prevalence, attributed to sedentary lifestyles, obesity, and diets rich in fats but low in fiber (3).

Gallstones, classified based on their number into solitary and multiple types, vary in their clinical presentation, progression, and associated complications (4). International studies highlight that solitary gallstones are often asymptomatic or present with fewer initial symptoms, but they are associated with a higher risk of developing gallbladder carcinoma, particularly in Asian populations (5). In contrast, multiple gallstones are frequently linked to acute complications, including recurrent biliary colic and acute cholecystitis, necessitating earlier intervention (6).

The prevalence of gallstones varies globally, influenced by factors such as age, gender, genetics, and comorbidities. In the United States, for instance, the prevalence is estimated at 20% in females and 10% in males aged over 40 years (7). In Europe, similar trends are observed, with higher prevalence rates in Northern countries compared to Southern regions (8). Pakistani studies mirror these findings but also highlight unique local risk factors, including higher rates of gallstones in multiparous women and individuals with metabolic syndrome. These differences underline the importance of contextualized research to guide local healthcare policies and interventions.

Gallstone disease imposes a significant burden on healthcare systems in Pakistan, where limited resources necessitate efficient and evidence-based management strategies (9). The clinical differentiation between solitary and multiple gallstones offers an opportunity to improve patient outcomes through tailored treatment plans. The higher risk of malignancy in solitary gallstones underscores the importance of vigilant monitoring and early detection in high-risk groups, particularly in regions like Pakistan, where gallbladder carcinoma incidence is disproportionately high. Conversely, the recurrent complications associated with multiple gallstones suggest a need for prompt and possibly prophylactic surgical interventions to prevent morbidity and reduce healthcare costs (10).

This study explored the comparative clinical profiles of solitary versus multiple gallstones in the Pakistani population, a topic not previously examined in depth. It aimed to fill a knowledge gap by evaluating symptomatic presentations, the demographic and metabolic factors that may influence the prevalence of each type. By considering Pakistan's unique sociocultural and healthcare context, the research sought to improve diagnostic and therapeutic guidelines, enhancing patient care and resource management. Additionally, it addressed the need for localized data to complement global evidence, offering insights into regional variations that could enhance the global understanding of gallstone disease.

Methodology

The study had a prospective observational design. After receiving approval from the Ethical Review Committee, the study was conducted for six months, from October/2024 to March/2025, at the General Surgery Department of Combined Military Hospital, Hyderabad. The study enrolled 141 patients who had gallstones as diagnosed on ultrasonography. The sample size of 141 patients was calculated, keeping a 95% confidence level, 5% margin of error, and expected prevalence of

gallstones in the Pakistani population as 10.2%[11]. Non-probability consecutive sampling technique was used. The study included all patients aged between 18-60 years, of both genders, who were diagnosed with gallstones by ultrasonographic findings. Patients with a history of cholecystectomy, with gallbladder polyps or malignancy, patients with other biliary pathologies such as choledocholithiasis or biliary atresia, and pregnant women were excluded.

The primary outcome measure assessed was the clinical presentation of patients with solitary gallstones versus those with multiple gallstones. The secondary outcomes assessed were the demographic profile (age and gender), intra-operative features of gallbladder, duration of intraoperative period (i.e. the duration from the patient entering in to the operation theatre till shifting to the postoperative room as assessed in minutes) and duration of stay in the hospital postoperatively (assessed in hours as a duration from shifting to the postoperative room till discharge from the hospital).

After taking written informed consent from all patients who fulfilled the selection criteria, the study was carried out. Every gallstone patient with a sonographic diagnosis was admitted to the ward and were divided into two groups according to odd and even number in terms of presence of number of stones i.e. patients with odd number were listed in Group A (Multiple stones) and with even number were listed in Group B (Solitary stone) Baseline demographic profile, clinical presentation and physical examination was carried out of all patients and findings were noted down on a predesigned proforma. Following the completion of all required preoperative workup, all patients underwent surgical intervention, i.e., laparoscopic cholecystectomy under elective circumstances. The gallstones were seen once the gallbladder was cut open. The surgery was completed according to the hospital's standard protocols. All patients were followed up till discharge, and outcomes were assessed. The results were recorded and then statistically analyzed.

Collected data was analyzed through the computer software Statistical Package for Social Sciences (SPSS) version 25.0. Normality of data was assessed using the Shapiro-Wilk test. As the data was non-normal in distribution therefore quantitative variables such as age, intraoperative duration, and duration of stay at the hospital were presented as mean and standard deviation. Qualitative data, such as gender, socioeconomic status, age group, clinical presentation, intraoperative findings, and complications, were presented as frequencies and percentages. Comparison of both groups in terms of intraoperative duration and duration of hospital stay was done using the Mann-Whitney U test, and a p-value of ≤ 0.05 was considered significant. Comparison of both groups in terms of clinical presentation, demographic features, intraoperative findings, and complications was done using Chi chi-squared test and a p-value of ≤ 0.05 was considered significant.

Results

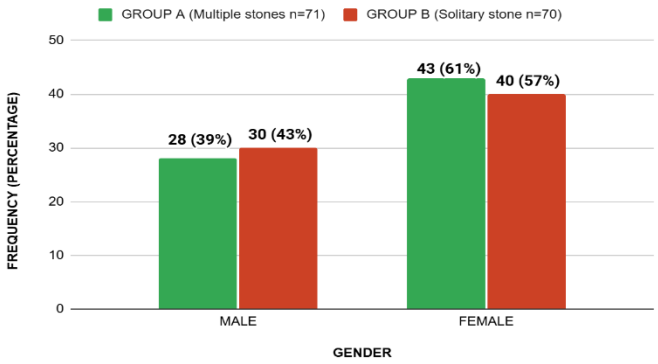
A total of 141 patients were enrolled. There were 71 patients in Group A and 70 patients in Group B. The median (IQR) age of patients in Group A was 45 (13) years, and in Group B was 42 (13) years (Z=-0.522, p=0.601). The median (IQR) intraoperative duration in Group A was 42 (4) minutes and in Group B was 41 (7) minutes (Z=-2.413, p=0.016). The median (IQR) total leucocyte count in Group A was 7100 (2500) WBCs per microliter, and in Group B was 6850 (3025) WBCs per microliter (Z=-0.679, p=0.497). The median (IQR) duration of stay at the hospital was 6 (2) days in Group A and 4 (1) days in Group B (Z=-9.097, p=0.000) (Table I).

There were 28 (39%) males and 30 (43%) females in Group A and 43 (61%) males and 40 (57%) females in Group B (Figure 1). Concerning age group, in Group A, 9 (12%) patients were of age group 18 to 30 years, 31 (44%) patients were of age group 31 to 45 years and 31 (44%) patients were of age group 46 to 60 years, whereas, in Group B, 11 (16%) patients were of age group 18 to 30 years, 31 (44%) patients were of age group 31 to 45 years and 28 (40%) patients were of age group 46 to 60 years (Figure 2).

In Group A, the site of pain was right hypochondrium in 17 (23.9%) patients, epigastrium in 35 (49.3%) patients and both sites in 19 (26.8%) patients, whereas, in Group B, the site of pain was right hypochondrium in 35 (50%) patients, epigastrium in 21 (30%) and both sites in 14 (20%) patients (p=0.005). In terms of clinical presentation, in Group A, 33 (46.5%) patients presented with pain, 23 (32.4%) patients had dyspepsia, 3 (4.2%) patients had nausea, 3 (4.2%) patients had vomiting and 9 (12.7%) patients had fever, whereas in Group B, 27 (38.6%) patients presented with pain, 20 (28.6%) patients had dyspepsia, 7 (10%) patients had nausea, 4 (5.7%) patients had vomiting and 12 (17.1%) patients had fever (p=0.562).

Among the patients in Group A, no clinical signs on examination were seen in 42 (59.1%) patients, 22 (31%) patients had abdominal tenderness, 6 (8.5%) patients had icterus, and 1 (1.4%) patient had a palpable mass. In Group B, 51 (72.9%) patients had no clinical signs, 17 (24.3%) patients had abdominal tenderness, 2 (2.8%) patients had icterus, and none of the patients had a mass. The liver function tests were deranged in 15 (21.1%) patients in Group A and 5 (7.1%) patients in Group B. In terms of intraoperative features, it was found that in Group A, 23 (32.4%) patients had normal GB, 15 (21.1%) had gangrenous GB, 5 (7%) patients had GB distension, 2 (2.8%) patients had GB contraction, 7 (9.9%) patients had adhesion, 12 (16.9%) patients had aspiration, 4 (5.6%) patients had thickening of GB wall and 3 (4.3%) patients had mucosal edema. In Group B, 32 (45.7%) patients had normal GB, 2 (2.9%) had gangrenous GB, 1 (1.4%) had GB distension, 4 (5.7%) had GB contraction, 7 (10%) patients had adhesion, 10 (14.3%) patients had aspiration, 8 (11.4%) patients had GB wall thickening and 6 (8.6%) patients had mucosal edema (p=0.016) (Table-II).

Figure 1: Gender distribution of patients in both groups (n=141)



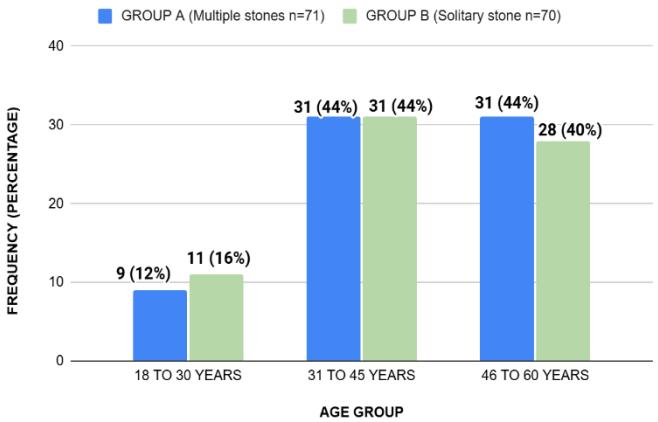


Figure 2: Distribution of patients according to age groups in both groups (n=141).

Table 1: Median (IQR) of the quantitative variables (n=141)

Variable	Group A(Multiple Gallstones)n = 71	Group B(Solitary Gallstone)n = 70	Z value	p Value
Age (in years)	45 (13)	42 (13)	-0.522	0.601
Intraoperative duration (min)	42 (4)	41 (7)	-2.413	0.016
Total leucocyte count(WBCs/µL)	7100 (2500)	6850 (3025)	-0.679	0.497
Duration of hospital stay (days)	6 (2)	4 (1)	-9.079	0.000

Table 2: Frequency of clinical findings among patients in both groups (n=141)

Variables	Group A (Multiple gallstones) n=71	Group B (Solitary gallstone) n=70	p value
Site of pain:			
Right hypochondrium	17 (23.9%)	35 (50%)	0.005
Epigastrium	35 (49.3%)	21 (30%)	
Both	19 (26.8%)	14 (20%)	
Clinical presentation:			
Pain	33 (46.5%)	27 (38.6%)	
Dyspepsia	23 (32.4%)	20 (28.6%)	0.562
Nausea	3 (4.2%)	7 (10%)	
Vomiting	3 (4.2%)	4 (5.7%)	
Fever	9 (12.7%)	12 (17.1%)	
Clinical signs:			
No signs	42 (59.1%)	51 (72.9%)	
Abdominal tenderness	22 (31%)	17 (24.3%)	0.212
Icterus	6 (8.5%)	2 (2.8%)	
Mass	1 (1.4%)	0 (0%)	
Liver function tests:			
Normal	56 (78.9%)	65 (92.9%)	0.017
Deranged	15 (21.1%)	5 (7.1%)	
Intraoperative features:			
Normal gallbladder	23 (32.4%)	32 (45.7%)	
Gangrenous gallbladder	15 (21.1%)	2 (2.9%)	0.016
Gallbladder distension	5 (7%)	1 (1.4%)	
Gallbladder contraction	2 (2.8%)	4 (5.7%)	
Adhesion	7 (9.9%)	7 (10%)	
Aspiration	12 (16.9%)	10 (14.3%)	
Gallbladder wall thickening	4 (5.6%)	8 (11.4%)	
Mucosal edema	3 (4.3%)	6 (8.6%)	

Discussion

The current study findings revealed that in patients with gallstones, the commonest presenting symptom in patients with multiple and solitary gallstones was pain, followed by dyspepsia and fever, and the most common clinical sign in both groups was abdominal tenderness. The gallstones were mainly common in the age group of 31 to 45 years, and the majority of the patients in both groups were females. The site of pain was mainly the epigastrium in patients with multiple stones and the right hypochondrium in patients with solitary stones. LFTs were significantly deranged in the multiple gallstones group. There was a significant difference between both groups in terms of intraoperative duration, intraoperative features, and duration of stay at the hospital.

One of the biggest health issues in the world is gallstones **(**12-14**)**. The most common presentation for patients with symptomatic stones is recurring episodes of epigastric or right upper quadrant pain, which is most likely caused by a stone impaction in the cystic duct **(**15-17**)**. It has been assumed that in comparison to numerous gallstones, solitary gallstone disease presents more dramatically, has more noticeable physical symptoms, and is linked to higher risks of developing mucocele, empyema, gallbladder perforation, and surgical complications **(**18,19**)**. However, conflicting evidence has been yielded regarding this in the previous literature **(**20**)**. Keeping this in view, the current study was conducted to compare the clinical profile of patients with solitary versus multiple gallstones.

In our study, the median age of the participants in the multiple gallstones group was 45, and in the solitary gallstones group was 42. Singh *et al.* revealed that the majority of the patients with gallstones were between the ages of 30 to 50 years **(**1**)**. Misrani *et al.* similarly revealed that the mean age of the participants was 44 years, who had gallstones **(**2**)**.

The majority of the participants in our study were females in both groups. Baghel *et al.* revealed that there was female predominance in patients with solitary as well as multiple gallstones **(**12**)**. Misrani *et al.* revealed that in their study on patients with gallstones, 80% of the participants were females. Singh *et al.* similarly reported that the majority of the participants with gallstones were females in their study, i.e., 82% **(**1**)**.

In our study, patients with multiple gallstones presented more with pain, dyspepsia and fever and on clinical examination had more abdominal tenderness icterus and deranged LFT profile, and solitary gallstones patients presented with more nausea and vomiting compared to those with multiple gallstones, however, the two groups did not differ significantly in terms of clinical presentation and clinical signs. Misrani *et al.* revealed that in patients with multiple gallstones, fever was more frequently reported compared to in patients who had solitary gallstones **(**2**)**. However, the frequency of pain, dyspepsia, and nausea/vomiting was high in both groups. Singh *et al.* revealed that in terms of presenting symptoms, pain, fever, dyspepsia, nausea, and abdominal tenderness were more frequently reported by patients with multiple gallstones as compared to patients with single gallstones. However, vomiting was more common in patients with single gallstones **(**1**)**. Baghel *et al.* also revealed that

although some symptoms, such as fever, were more frequent in multiple gallstone patients, there was still no statistically significant difference between the two groups in terms of clinical presentation **(**12**)**. These findings support our study findings that both solitary and multiple gallstones have overlapping presentations and have no significant statistical difference.

In terms of intraoperative duration, our study revealed that there was a significant difference between the two groups, and patients with multiple gallstones had longer intraoperative durations.

In terms of intraoperative findings, our study results revealed that patients with multiple gallstones had a significantly higher frequency of gallbladder gangrene, distension, adhesion, and aspiration compared to solitary gallstones. Similar findings were revealed by Baghel *et al* **(**12**)**.

Our study results showed that the duration of hospital stay was significantly higher in patients with multiple gallstones compared to those with solitary stones. Similar findings were revealed by Singh *et al* **(**1**)**.

Patients with multiple gallstones had worse clinical profiles in terms of preoperative fever, abdominal pain, and abdominal tenderness. These factors contribute to challenging intraoperative complications, such as gallbladder adhesions and gangrene, which ultimately result in longer surgical times. In the postoperative phase, pain reduces ambulatory capacity, extending hospital stays. Therefore, to prevent serious complications during the intraoperative period and the conversion of laparoscopic cholecystectomy to an open cholecystectomy, which would ultimately affect the length of hospital stay, patients with gallstones, whether single or multiple, diagnosed during USG or incidentally as asymptomatic (more preferably multiple gallstones), must be counseled and motivated to have surgery as soon as possible.

Conclusion

The current study concluded that there was no significant difference in the clinical presentations of multiple versus solitary gallstones; however, there was a significant difference in terms of intraoperative duration, intraoperative findings, and duration of hospitalization. Even though the clinical signs and symptoms of individuals with single and multiple gallstones are similar, the results of surgery might vary greatly. Our study leads us to suggest that patients with multiple gallstones should be encouraged to have surgery as soon as possible and given preoperative counseling regarding the chances of a favorable outcome. Future studies must be carried out on a larger scale in order to validate the current study findings.

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Limitations:

There were certain limitations of the study. The results of this study cannot be generalized because it was a single-center study with a small sample size. Secondly, the comparison of multiple gallstones with solitary gallstones in terms of postoperative outcomes and complications was not assessed. Thirdly, the effect of open versus laparoscopic cholecystectomy on the outcomes of multiple versus solitary gallstones was not assessed, which could have provided a better understanding of the appropriate surgical intervention to be carried out.

Declarations

Data Availability statement

All data generated or analysed during the study are included in the manuscript.

Ethics approval and consent to participate

Approved by the department concerned. (IRBEC-TCDAB-24)

Consent for publication

Approved

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Conflict of interest

The authors declared the absence of a conflict of interest.

Author Contribution

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Manuscript drafting, Study Design,
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SAS (Consultant General Surgeon)
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Review of Literature, Data entry, Data analysis, and drafting article.

All authors reviewed the results and approved the final version of the manuscript. They are also accountable for the integrity of the study.

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