



INSIGHTS INTO DEMOGRAPHICS, ETIOLOGY, TREATMENT APPROACHES, AND COMPLICATIONS OF GALLBLADDER PERFORATION: A COMPREHENSIVE STUDY

Dr Zahida Akhtar¹, Dr Showkat Majeed Kakroo²

Article History: Received: 22.05.2023

Revised: 05.06.2023

Accepted: 26.07.2023

Abstract

Background: Gallbladder perforation represents a critical condition characterized by the rupture or puncture of the gallbladder wall, leading to the leakage of bile and potentially causing severe complications. This study aims to shed light on our institution's clinical experience in managing cases of gallbladder perforation, drawing upon a wealth of accumulated expertise and intricate patient encounters.

Methods: In this prospective study, a total of 45 patients were included in the study strictly as per the inclusion criteria of the study. These patients were comprehensively evaluated for numerous parameters to meet the objectives of the study.

Results: The study showed diverse age distribution, with a higher proportion in the 51-60 years age group and slightly more female patients. Prevalent comorbidities included diabetes (42%) and hypertension (28.9%), emphasizing the need for comprehensive care. Calculous cholecystitis was the main cause (88.9%), and Type II gallbladder perforation was the most common (75.6%). Percutaneous drainage was the primary treatment (84.4%), followed by laparoscopic cholecystectomy (8.9%) and emergency laparotomy (6.7%). Hospitalization durations varied, with a significant number requiring 7-10 days. Complications such as peritonitis, sepsis, cholecystoenteric fistula, and pleural effusion highlighted the risks associated with gallbladder perforation.

Conclusion: The study comorbidities like diabetes and hypertension were prevalent. Calculous cholecystitis was the main cause, with Type II gallbladder perforation being common. Percutaneous drainage was the primary treatment, with varying hospitalization durations. Complications highlighted the risks. Findings contribute to knowledge, emphasizing the need for a multidisciplinary approach.

Keywords: Gall stones, Cholecystitis, Peritonitis.

¹Associate Professor, Department of General and Laparoscopic Surgery, SKIMS Medical College and Hospital, Bemina Srinagar, Jammu & Kashmir

²Medical Officer, Jammu and Kashmir Health Sciences

***Corresponding Author**

Dr Zahida Akhtar

Email: drzahidaamaan@gmail.com

DOI: 10.31838/ecb/2023.12.s3.774

1. Introduction

Gallbladder perforation represents a critical condition characterized by the rupture or puncture of the gallbladder wall, leading to the leakage of bile and potentially causing severe complications. In recent years, the incidence of gallbladder perforation has posed a considerable medical concern, necessitating diligent attention and advanced management strategies.¹ The primary etiology of gallbladder perforation predominantly stems from cholecystitis, either with or without cholelithiasis.² Notably, in the elderly population, spontaneous gallbladder perforation may occur as a secondary manifestation of atherosclerosis, vasculitis, or focal vasospasm, reflecting the intricate interplay between age-related physiological changes and vascular pathologies. Niemeier's classification system provides a comprehensive framework for categorizing gallbladder perforation into distinct types. Type 1 refers to acute free perforation, where rupture occurs directly into the peritoneal cavity, imparting an immediate and severe clinical impact.³ Type 2 denotes subacute perforation, characterized by the formation of a pericholecystic abscess, thereby presenting a more indolent and localized manifestation. Lastly, type 3 represents chronic perforation, often accompanied by the formation of a cholecystoenteric fistula, highlighting a chronicity that necessitates careful consideration and management.^{3,4} Gallbladder perforation carries a substantial burden of both mortality and morbidity, underscoring the urgency and criticality of prompt intervention. Such cases require specialized expertise and a multidisciplinary approach to ensure timely and optimal patient outcomes.

The management of gallbladder perforation in a tertiary care center encompasses a wide range of considerations, including diagnostic modalities, surgical techniques, perioperative care, and postoperative management. Advanced imaging technologies; such as computed tomography (CT) scanning and magnetic resonance imaging (MRI), play pivotal roles in enabling the accurate assessment and identification of gallbladder perforation, thus facilitating the development

of tailored treatment plans. Surgical intervention remains the cornerstone of management for gallbladder perforation, and the expertise of highly skilled surgeons is essential to ensure successful outcomes. Minimally invasive techniques, such as laparoscopic cholecystectomy, have revolutionized the field, offering the benefits of reduced surgical trauma, improved postoperative recovery, and decreased hospital stays. Additionally, in complex cases, open cholecystectomy may be required, necessitating the surgical team's proficiency in handling challenging anatomical variations and potential complications. Furthermore, the perioperative care of patients with gallbladder perforation demands a comprehensive approach to optimize outcomes. This involves preoperative optimization, tailored anesthesia management, and vigilant postoperative monitoring to promptly identify and manage potential complications, such as infection, bile leak, or bile peritonitis. This study aims to shed light on our institution's clinical experience in managing cases of gallbladder perforation, drawing upon a wealth of accumulated expertise and intricate patient encounters. By comprehensively examining these cases, we can unravel the nuances and intricacies associated with gallbladder perforation, paving the way for improved management strategies and enhanced patient outcomes.

2. Methods

The aim of our study was to comprehensively explore the Etiopathogenesis, Diagnosis, Management, and Complications of gallbladder perforations. Ethical clearance was obtained from the Institutional Ethical Committee, and the study was conducted in the Postgraduate Department of General Surgery, Government Medical College, Srinagar, over 18 months. Inclusion criteria involved all patients with gallbladder perforation exhibiting clinical and radiological evidence, admitted to the hospital until their discharge. Exclusion criteria included gallbladder malignancies, iatrogenic perforations, and traumatic perforations. Detailed symptomatic history, clinical features, and thorough physical examinations were performed on patients

presenting to the emergency department. Routine investigations such as CBC, LFT, KFT, serum electrolytes, serology, and blood sugar levels were carried out, along with special radiological examinations like USG abdomen and pelvis and CECT abdomen and pelvis to confirm the diagnosis. The patients

were appropriately classified and treated based on their condition.

3. Results

In this section, the results of the study will be described:

Table 1: Age distribution of study patients		
Age (Years)	Number	Percentage
≤ 40 Years	7	15.6
41-50 Years	10	22.2
51-60 Years	16	35.6
> 60 Years	12	26.7
Total	45	100
Mean±SD=53.1±7.84		

The data reveals that among the study patients, 15.6% were aged ≤ 40 years, while 22.2% fell within the 41-50 years age range. The largest proportion of patients, comprising 35.6%, belonged to the 51-60 years age group. Furthermore, 26.7% of the study population were older than 60 years. The mean age of the

study participants was calculated to be 53.1 years, with a standard deviation (SD) of 7.84. The data reveals that among the study patients, 46.7% were male, while 53.3% were female, indicating a slightly higher representation of female patients within the cohort.

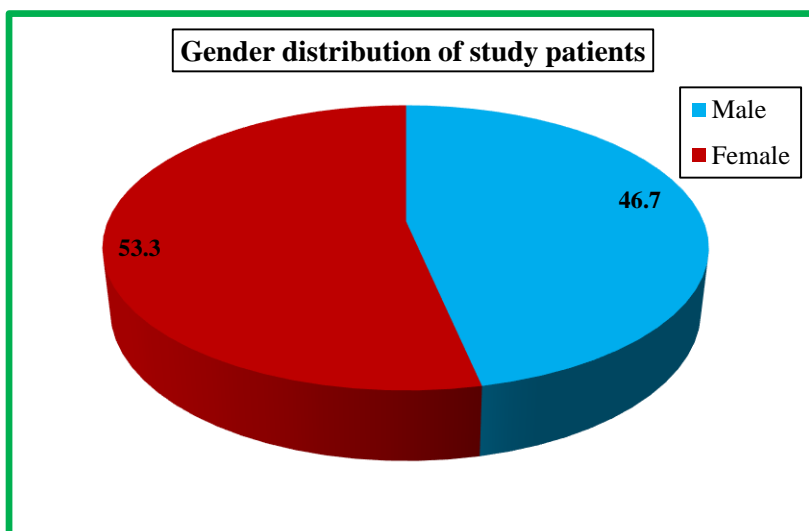
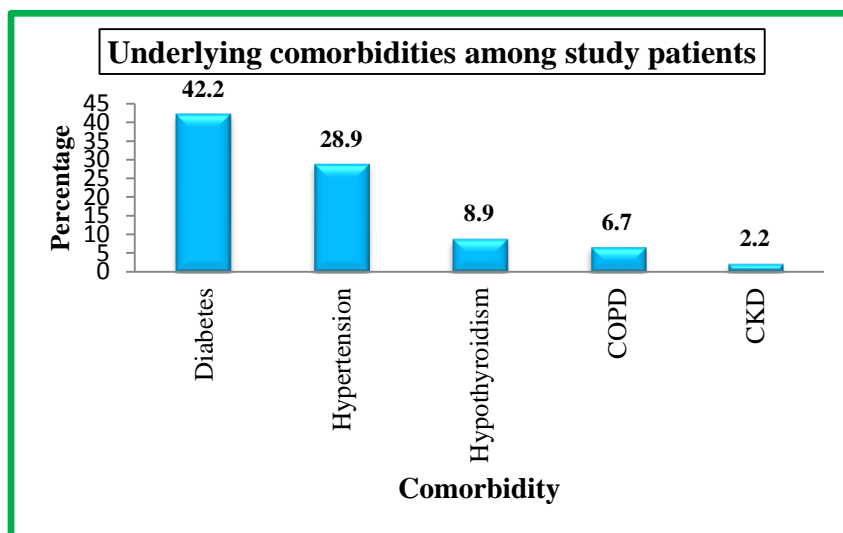


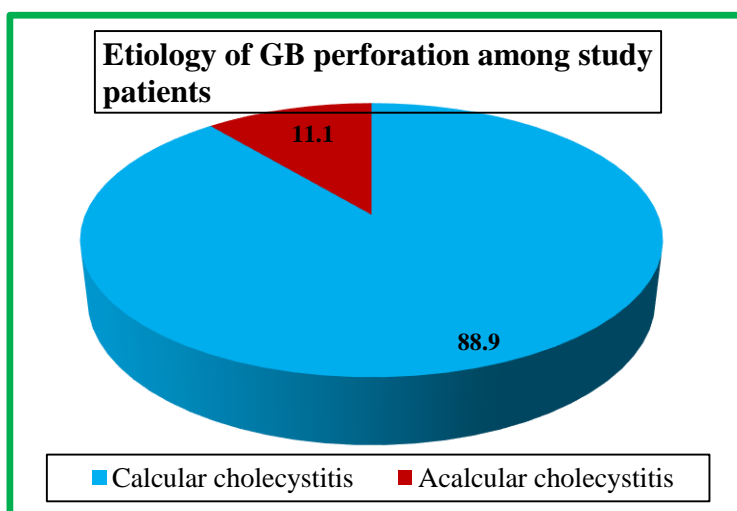
Table 3: Underlying comorbidities among study patients		
Comorbidity	Number	Percentage
Diabetes	19	42.2
Hypertension	13	28.9
Hypothyroidism	4	8.9
COPD	3	6.7
CKD	1	2.2

We observe that 42.2% had diabetes, indicating a significant proportion of individuals with this comorbidity. Hypertension was the second most prevalent condition, affecting 28.9% of the patients. Hypothyroidism was observed in 8.9% of the study population, followed by chronic obstructive pulmonary disease (COPD) in 6.7%. Additionally, chronic kidney disease (CKD) was present in 2.2% of the patients.



Etiology	Number	Percentage
Calcularcholecystitis	40	88.9
Acalcularcholecystitis	5	11.1
Total	45	100

We observe that among the study patients, 88.9% of cases were attributed to calculous cholecystitis, indicating a significant predominance of gallbladder perforation caused by the presence of gallstones. On the other hand, 11.1% of the study population had acalculous cholecystitis, which denotes inflammation of the gallbladder in the absence of gallstones.



Type of GB perforation	Number	Percentage
Type I	7	15.6
Type II	34	75.6
Type III	4	8.9
Total	45	100

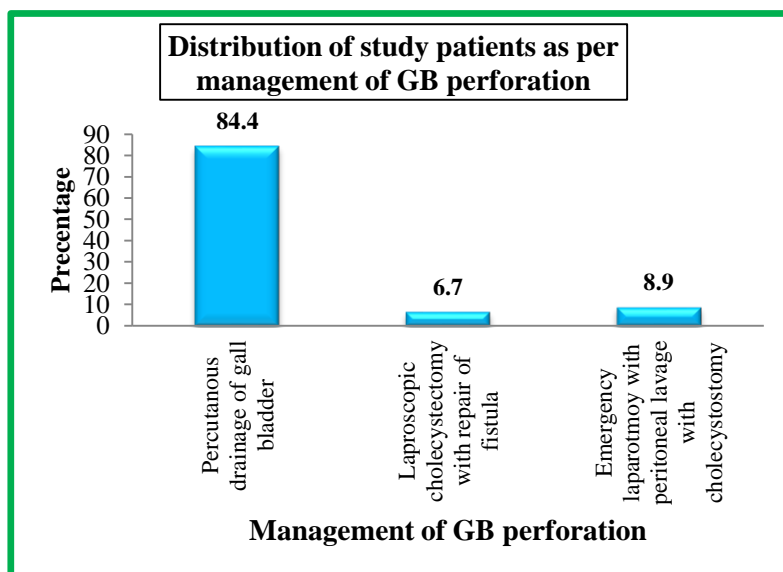
Among the study patients, 15.6% experienced Type I GB perforation, characterized by acute free perforation into the peritoneal cavity. Type II GB perforation, indicating subacute perforation with the presence of a

pericholecystic abscess, was observed in 75.6% of the cases. Type III GB perforation, which represents chronic perforation with a cholecystoenteric fistula, accounted for 8.9% of the patients.

Management of GB perforation	Number	Percentage
Percutaneous drainage of gall bladder	38	84.4
Laparoscopic cholecystectomy with repair of fistula	3	6.7
Emergency laparotomy with peritoneal lavage with cholecystostomy	4	8.9
Total	45	100

The data reveals that among the study patients, the majority (84.4%) underwent percutaneous drainage of the gallbladder. This approach involves the insertion of a drainage tube through the skin into the gallbladder to drain accumulated fluid or abscess. A smaller proportion of patients (6.7%) underwent laparoscopic cholecystectomy with repair of the fistula. This surgical procedure involves the removal of the gallbladder through

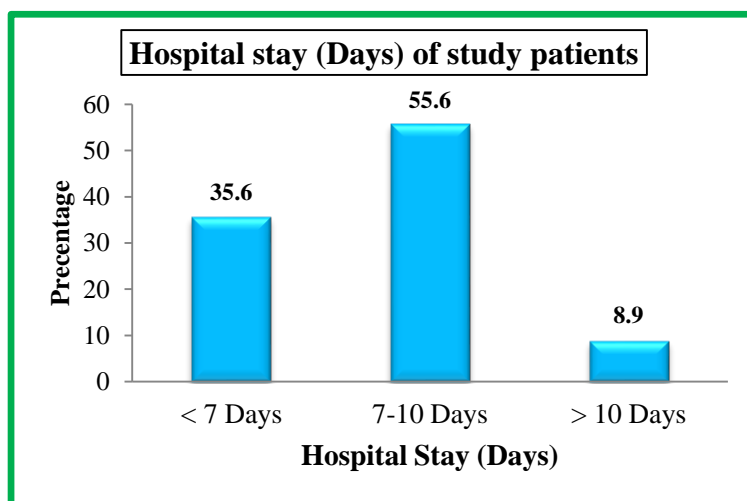
minimally invasive techniques, coupled with the repair of any cholecystoenteric fistulas present. Emergency laparotomy with peritoneal lavage and cholecystostomy was performed in 8.9% of the study population. This approach involves a surgical incision into the abdomen, followed by washing the peritoneal cavity and creating a temporary opening into the gallbladder (cholecystostomy) for drainage purposes.



Hospital stay (Days)	Number	Percentage
< 7 Days	16	35.6
7-10 Days	25	55.6
> 10 Days	4	8.9
Total	45	100
Median (Range)=7 Days (5-16 Days)		

The data reveals that among the study patients, 35.6% had a hospital stay of fewer than 7 days, indicating a relatively shorter duration of

hospitalization for a significant proportion of the cohort.



A slightly larger proportion (55.6%) of patients had a hospital stay ranging from 7 to 10 days. Additionally, 8.9% of the study population required a hospital stay of more

than 10 days, indicating a longer duration of treatment and recovery for a smaller subset of patients.

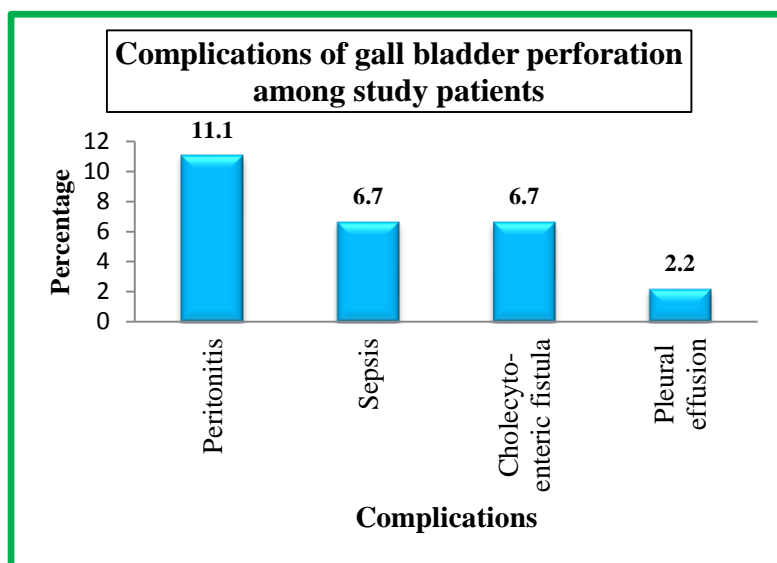
Complications	Number	Percentage
Peritonitis	5	11.1
Sepsis	3	6.7
Cholecysto-enteric fistula	3	6.7
Pleural effusion	1	2.2

We observe that among the study patients, 11.1% experienced peritonitis, which is inflammation and infection of the peritoneum, the lining of the abdominal cavity. Sepsis, a severe systemic infection, was observed in

6.7% of the patients. Additionally, 6.7% of the study population developed a cholecysto-enteric fistula, an abnormal connection between the gallbladder and the gastrointestinal tract. One patient (2.2%)

experienced pleural effusion, the accumulation of fluid in the pleural cavity surrounding the

lungs



3. Discussion

The management of gallbladder perforation is a topic of utmost importance, given the potential severity and associated risks of this condition. Gallbladder perforation is a critical and potentially life-threatening complication that requires prompt and effective management to minimize morbidity and mortality. The primary goal of managing gallbladder perforation in a tertiary care center is to ensure early diagnosis, timely intervention, and comprehensive treatment. A multidisciplinary approach involving surgeons, radiologists, gastroenterologists, and intensivists is crucial for providing optimal care to these patients. In the present study, we observed that 15.6% were aged ≤ 40 years, while 22.2% fell within the 41-50 years age range. The largest proportion of patients, comprising 35.6%, belonged to the 51-60 years age group. Furthermore, 26.7% of the study population was older than 60 years. The mean age of the study participants was calculated to be 53.1 years, with a standard deviation (SD) of 7.84. In line with our findings, several previous studies have reported similar age distributions among patients with gallbladder perforation. A study conducted by Nandyala et al. (2016) found that the commonest age group where gall bladder perforation was reported was 48 to 60 years, which is consistent with our

study.⁶ Derici et al, reported in their study that mean age of their patients was 69 (range, 54-85) years, which is compatible with our study.¹ In the present study, there were 46.7% male, while 53.3% were females, indicating a slightly higher representation of female patients within the cohort. There is a variation in reported gender predominance in gallbladder perforation across different studies, with some studies reporting male predominance and some female predominance. For instance, Harraz et al, in their study reported female predominance (57.8%) over males (42.1%), which is consistent with our study while as Derici et al in their study reported a male predominance over females (62% vs 38%).^{1,7} The reported gender predominance in gallbladder perforation can be influenced by the interplay of various factors, including the incidence of gallstones, hormonal influences, obesity rates, and the characteristics of the study population. Further research involving larger, diverse cohorts and standardized methodologies will help to elucidate the underlying factors contributing to gender differences in gallbladder perforation.

In the present study, when the underlying comorbidities among study patients were assessed, we observed that 42.2% had diabetes, indicating a significant proportion of individuals with this comorbidity. Hypertension was the second most prevalent

condition, affecting 28.9% of the patients. Hypothyroidism was observed in 8.9% of the study population, followed by chronic obstructive pulmonary disease (COPD) in 6.7%. Additionally, chronic kidney disease (CKD) was present in 2.2% of the patients. Similar results have been documented by Harraz et al and Morris et al, who reported that diabetes and cardiac abnormality were more prevalent among patients with gall bladder perforation.^{7,8} When the etiological factors among study patients were assessed, we found that the majority of cases (88.9%) were associated with calculous cholecystitis, highlighting a notable prevalence of gallbladder perforation resulting from the presence of gallstones. Conversely, 11.1% of the study population presented with acalculous cholecystitis, indicating inflammation of the gallbladder without the presence of gallstones. The findings of this study are in line with previous studies, providing further support for the prevalence of gallbladder perforation associated with calculous and acalculous cholecystitis. For instance, a study by Sheema et al. observed that 91.4% of patients had calculous cholecystitis, while only 8.6% had acalculous cholecystitis.⁹ The incidence of gallbladder perforation in acute cholecystitis has been reported to range from 2% to 18%. Interestingly, when comparing calculous and acalculous cholecystitis, the overall incidence of gallbladder perforation due to acalculous cholecystitis is higher, with estimates reaching approximately 10% to 20%.¹⁰ In a study conducted by Nandyala VNR et al. in 2016, it was found that out of the total 18 patients, 15 had calculous cholecystitis, while 3 had acalculous cholecystitis, providing further evidence of the prevalence of gallbladder perforation in both conditions.⁶

Among our study patients, 15.6% experienced Type I GB perforation, characterized by acute free perforation into the peritoneal cavity. Type II GB perforation, indicating subacute perforation with the presence of a pericholecystic abscess, was observed in 75.6% of the cases. Type III GB perforation, which represents chronic perforation with a cholecystoenteric fistula, accounted for 8.9%

of the patients. In their study, Sheema et al. (year) reported the occurrence of gallbladder (GB) perforation in various types among the patients. Type 2 GB perforation was observed in 30 patients (85.7%), followed by Type 1 in 3 patients (8.6%), and Type 3 in 2 patients (5.7%). This indicates that Type 2 GB perforation was the most prevalent among the patients, which is in consonance with our study.⁹ In another study conducted by Patel et al. (2019), 16 patients were examined, among which 11 were diagnosed with gallbladder perforation. Among these patients, Type 2 perforation was found to be the most common, with 7 patients (43.75%) exhibiting this type. Type 1 perforation was observed in 5 patients (31.3%), while Type 3 perforation was seen in 4 patients (25%).¹¹ Furthermore, Tubachi et al. (2018) conducted a study involving 11 patients with gallbladder perforation. Among them, 7 patients had Type 1 perforation, 3 patients had Type 2 perforation, and 1 patient had Type 3 perforation.⁵

Regarding the treatment approaches, the predominant treatment approach among the study patients was percutaneous drainage of the gallbladder, which was employed in a majority of cases (84.4%). Percutaneous drainage entails the insertion of a drainage tube percutaneously, directly into the gallbladder, facilitating the removal of accumulated fluid or abscesses. A smaller proportion of patients (6.7%) underwent laparoscopic cholecystectomy with concurrent fistula repair. This minimally invasive surgical procedure involves the removal of the gallbladder, accompanied by the mending of any cholecystoenteric fistulas that may be present. Emergency laparotomy with peritoneal lavage and cholecystostomy was conducted in 8.9% of the study population. This operative intervention entails making an incision in the abdomen, followed by irrigation of the peritoneal cavity and establishing a temporary opening in the gallbladder (cholecystostomy) to enable drainage. In a study by Sheema et al, percutaneous drainage of the gallbladder was performed in the majority of cases, specifically in 30 patients (85.7%). Emergency laparotomy with peritoneal lavage and cholecystostomy was carried out in 3 patients (8.6%). Additionally,

laparoscopic cholecystectomy with repair of the fistula was performed in 2 patients (5.7%), which is in line with our results.⁹ In a captivating retrospective review by Bhattarai et al. (2021), the medical and/or surgical treatment received by 24 patients diagnosed with gallbladder perforation was carefully examined. Their study revealed that operative management was undertaken in a minority of cases, specifically 12.5% (n=3) of the patients.¹² Conversely, the predominant therapeutic approach employed was percutaneous drainage of the gallbladder, which was administered in a significant majority of cases, accounting for 87.5% (n=21) of the patients. The results of our study corroborated with other studies sheds light on the prevailing treatment strategies utilized for gallbladder perforation, emphasizing the prominence of percutaneous drainage as a preferred therapeutic intervention. In terms of hospital stay, the data showcases compelling insights among the study patients. Remarkably, 35.6% of the cohort experienced a brief hospitalization of fewer than 7 days, indicating a swift recovery and an expedited return to their daily lives. Moreover, a slightly larger proportion, accounting for 55.6% of patients, had a hospital stay spanning from 7 to 10 days, implying a slightly more complex or prolonged treatment process for this group. However, it is noteworthy that 8.9% of the study population necessitated an extended hospital stay exceeding 10 days, indicating a more intricate and demanding course of treatment, along with a lengthier recovery period. In their study, Sheema et al. found that the postoperative hospital stay for patients ranged from 5 to 14 days, with a median duration of 7 days. The majority of their patients, comprising 19 individuals (54.3%), required hospitalization for 7 to 10 days, indicating a common timeframe for recovery. Additionally, 12 patients (34.3%) had a hospital stay of fewer than 7 days, suggesting a relatively swift recuperation process.⁹ However, 4 patients (11.4%) necessitated a longer duration of hospitalization, exceeding 10 days, highlighting a more complex treatment trajectory, these results are in conformity with our study. In another study conducted by Bhattarai et al. (2021), the median duration of hospital stay was

determined to be 10 days, providing valuable insights into the average length of care required for patients in that particular study.¹² Similarly, Tubachi et al. (2018) confirmed that conservatively managed cases had hospital stays of less than ten days, while those who underwent operative intervention experienced a hospital stay exceeding ten days.⁵ These findings shed light on the varying durations of hospitalization observed in different studies, reflecting the diverse nature of patient conditions and treatment approaches.

Among the study patients, several complications were observed. Peritonitis, characterized by inflammation and infection of the abdominal cavity lining (peritoneum), affected 11.1% of the cohort. Sepsis, a severe systemic infection, was present in 6.7% of the patients. Furthermore, 6.7% of the study population developed a cholecysto-enteric fistula, an abnormal connection between the gallbladder and the gastrointestinal tract. One patient (2.2%) experienced pleural effusion, which involves the accumulation of fluid in the pleural cavity surrounding the lungs. In a study conducted by Nandyala et al. (2016), a range of complications was observed among the patients. Surgical site infections affected 11 individuals, respiratory tract infections were reported in 7 patients, and 3 patients experienced urinary tract infections.⁶ Similarly, in another study by Sheema et al., a total of 8 patients encountered complications during their course of treatment. Among these cases, 3 patients (8.6%) experienced peritonitis, 2 patients (5.7%) developed sepsis, 2 patients (5.7%) had cholecystoenteric fistulas, and 1 patient (2.9%) exhibited pleural effusion.⁹ These complications highlight the potential complexities and risks associated with the condition under investigation. The results of present study shed light on the diverse array of complications that can arise in patients undergoing treatment, emphasizing the importance of comprehensive medical care and diligent management to address and mitigate such challenges.

4. Conclusion

The management of gallbladder perforation is of utmost importance due to its severity and

associated risks. This study provided valuable insights into patient demographics, etiological factors, treatment approaches, hospital stays, and complications related to gallbladder perforation. The study revealed a diverse age distribution, with a higher proportion of cases in the 51-60 years age group, and slightly more female patients. Comorbidities such as diabetes and hypertension were prevalent, highlighting the need for comprehensive care. Calculous cholecystitis was the main underlying cause, with Type II gallbladder perforation being the most common. Percutaneous drainage emerged as the primary treatment, followed by laparoscopic cholecystectomy and emergency laparotomy. The varying durations of hospitalization reflected the complexity of cases, with a significant number requiring 7-10 days of hospital stay. Complications like peritonitis, sepsis, cholecystoenteric fistula, and pleural effusion underscored the risks associated with gallbladder perforation. These findings contribute to existing knowledge, emphasizing the importance of a multidisciplinary approach and comprehensive management strategies. Further research with larger cohorts and standardized methodologies is needed to advance our understanding and enhance patient care.

Acknowledgement: Authors are thankful to Statistician Dr. Zahoor Ahmad for carrying out the Statistical analysis of data.

Conflict of Interest: None declared

Ethical approval: Study was approved by institutional ethics committee.

5. References

1. Derici H, Kara C, Bozdog AD, Nazli O, Tansug T, Akca E. Diagnosis and treatment of gallbladder perforation. *World J Gastroenterol.* 2006 Dec 28;12(48):7832-6. doi: 10.3748/wjg.v12.i48.7832. PMID: 17203529; PMCID: PMC4087551
2. Schwartz's principles of surgery 10th edition Gall bladder and the extrahepatic biliary system, Thai H Pam. McGraw Hill Education; 2014;1309-1340.
3. Roslyn J, Busuttil RW. Perforation of the gallbladder: a frequently mismanaged condition. *Am J Surg.* 1979;137(3):307-12.
4. Niemeier OW. Acute Free Perforation of the Gall bladder. *Ann Surg.*1934;99:922-4.
5. Tubachi P, Kamath KS, Desai M, Kodliwadmth H. Gallbladder perforation: management in a tertiary care centre. *IntSurg J* 2018;5:3346-9.
6. Nandyala VNR, Pallam P, Chintakindi SB, Pallagani L, Kundarapu G. Gall bladder perforation - is it still a diagnostic dilemma: a retrospective study. *IntSurg J* 2016;3:609-13.
7. Harraz MM, Abouissa AH. Role of MSCT in the diagnosis of perforated gall bladder (a retrospective study). *Egyptian Journal of Radiology and Nuclear Medicine.* 2020 Dec;51(1):1-8.
8. Morris BS, Balpande PR, Morani AC, Chaudhary RK, Maheshwari M, Raut AA. The CT appearances of gallbladder perforation. *The British Journal of Radiology.* 2007 Nov;80(959):898-901.
9. Sheema JH, Naseer AA, Manzoor AP and Aamir HH. Gallbladder perforation: experience of 35 cases at a tertiary care hospital. *Int. J. Adv. Res.* 10(02), 1314-1319
10. Pisano, M., Ceresoli, M., Cimbanassi, S. *et al.* 2017 WSES and SICG guidelines on acute calculous cholecystitis in elderly population. *World J EmergSurg* **14**, 10 (2019). <https://doi.org/10.1186/s13017-019-0224-7>
11. Patel G, Jain A, Kumar RB, Singh N, Karim T, Mishra R. Gallbladder Perforation: A Prospective Study of Its Divergent Appearance and Management. *Euroasian J Hepatogastroenterol* 2019;9(1):14-19.
12. Bhattarai A, Devkota P, Shrestha A, Gurung K, Tmarakar KK, Neupane HC. Diagnosis and management of gallbladder perforation: a singlecenter experience. *Journal of Chitwan Medical College.*2021;11(37):97-100.