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MD, PGY IV

Analysis of post cholecystectomy syndrome, Single Institution Experience

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A thesis that is submitted to the Department of Surgery, TASH, in partial fulfillment for the certificate of specialty in General Surgery.

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APPROVAL SHEET

ADDS ABABA UNIVERSITY

COLLEGE HEALTH SCIENCE SCHOOL OF ALLIED SCIENCES DEPARTMENT OF SURGERY

I, the undersigned general surgery resident, declare that I have submitted my original work on a title Analysis of postcholecystectomy syndrome, single institution experience, Zewditu Memorial Hospital, Addis Ababa, Ethiopia, 2024.

Submitted by:

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This thesis work has been submitted for examination with my approval as an advisor.

Approved by:

Dr. Sahlu Wondimu	Signature	Date

Statement of the Author

I hereby declare that this thesis is my original work and has not been presented for a degree in any other university and all sources of material used for this thesis have been duly acknowledged.

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List of abbreviations

PCS: Postcholecystectomy syndrome

RUQ: Right upper quadrant

LC: Laparoscopic cholecystectomy

PUD: Peptic ulcer disease

GERD: Gastroesophageal reflux disease

SOD: Sphincter of Oddi dysfunction

CBD: Common bile duct

USG: Ultrasonography

ERCP: Endoscopic retrograde cholangiopancreatography

MRCP: Magnetic resonance cholangiopancreatography

EUS: Endoscopic ultrasound

RCT: Randomized control trial

BMI: Body mass index

1. Abstract

Background: Gallstone disease ranks among the most prevalent surgical conditions, with cholecystectomy being the primary treatment for gallstones. Post-cholecystectomy syndrome (PCS) refers to a variety of symptoms that occur in patients following gallbladder removal.

Objectives: This study seeks to assess and evaluate the occurrence and characteristics of post-cholecystectomy syndrome at Zewditu Memorial General Hospital over a one-year period, from January 1, 2023, to December 31, 2023.

Patients and Methods: A retrospective cross-sectional study was conducted over one year, involving 210 patients who underwent either open or laparoscopic cholecystectomy at Zewditu Memorial General Hospital between January 1, 2023, and December 31, 2023.

Results: The study included patients with a mean age of 40.19 ± 12 years and a median age of 37 years, with the majority (38.6%) in the 30–39 age group. Females constituted 86.7% (182) of the participants. Abdominal pain was reported by 92.8%, and 72.4% experienced fatty meal intolerance. Post-cholecystectomy syndrome (PCS), characterized by persistent biliary colic or right upper quadrant pain along with various gastrointestinal symptoms, was observed in 33% of patients. Among those with PCS, 25.7% reported persistent abdominal pain. Preoperative jaundice and advancing age were linked to an increased risk of PCS.

Conclusions: PCS is a prevalent condition at Zewditu Memorial General Hospital, often overlooked in its impact. Adopting advanced diagnostic methods, conducting comprehensive preoperative assessments, ensuring meticulous surgical planning, and maintaining precision during procedures can greatly reduce its occurrence, leading to improved patient outcomes and reduced healthcare costs.

2. Introduction

2.1 Background

Cholelithiasis is a prevalent gastrointestinal condition globally, imposing a significant burden on healthcare systems (1). In the United States, it represents a substantial health issue affecting 10-15% of the adult population (1,2). Across Asia, the frequency of gallstone disease ranges from 5-10%, particularly prevalent among females and the elderly (3). Guidelines often recommend conservative management for asymptomatic cases and laparoscopic cholecystectomy for symptomatic cases. Preoperative symptoms are commonly utilized as a diagnostic reference and to determine the necessity for cholecystectomy.

Postoperative outcomes and symptom relief are documented following cholecystectomy (4). Nevertheless, there exists a possibility of encountering complications such as bile duct damage, hemorrhage, bile duct narrowing, cholangitis, primary ductal formation, and injury to adjacent organs, among others (5). Additionally, there are instances where cholecystectomy fails to alleviate symptoms, leading to the persistence of symptoms after surgery (6). The persistence of symptoms has been documented since the inception of cholecystectomy, with an overall occurrence rate of 13% following laparoscopic cholecystectomy (7). A recent investigation revealed that the rate of persistent symptoms was 59% at one week and 13% at six months post-surgery (6). The continuation of symptoms after cholecystectomy has been termed post-cholecystectomy syndrome (PCS).

The term Post-cholecystectomy syndrome (PCS) encompasses a diverse array of symptoms and observations in individuals who have previously undergone cholecystectomy. The etiology can be broadly categorized into biliary, extra-biliary, organic, and functional factors. Despite its rarity, these individuals might exhibit symptoms such as abdominal pain, jaundice, or dyspepsia. A significant portion of these symptoms can be linked to complications like bile duct injury, biliary leak, biliary fistula, and the presence of bile duct stones. Delayed consequences may manifest as recurrent bile duct stones and bile duct strictures. Given the rising number of laparoscopic cholecystectomies being conducted, there is a likelihood of an increasing incidence of PCS cases (8).

Previous research has examined the predictors of PCS. Factors such as high trait anxiety, elevated BMI, smoking, alcohol consumption, longer preoperative symptom duration, preoperative awareness, preoperative flatulence, and preoperative nonspecific symptoms have been identified as potential predictors. Additionally, studies have indicated that a higher

frequency of PCS may be linked to factors such as age, female gender, longer preoperative symptom duration, functional acalculous gallbladder, and non-inflammatory gallbladder (9-13).

The magnitude of Gallstone disease in Ethiopia is not well known. A study in Gondar indicated the proportion of patients with cholelithiasis was 5.2%, with a female-to-male ratio of 2:1 (14). In a study done in Ethiopian, St paul's Millennium Medical College Hospital, in 2018, the prevalence of gallstones was 10.2% and it is more common in females, 72.7% (15). In a study done in Ayider Referral Hospital, in 2013, A total of 225 patients were included in the study. The age group 30-49 years comprised one-half of the patients and over two-thirds (71.6%) of the patients were female (16). PCS remains significantly underreported within the Ethiopian context, despite abundant literature documenting its prevalence in other nations. Numerous studies worldwide provide compelling evidence of symptom persistence following cholecystectomy, highlighting an imperative for investigation within Ethiopia. Patients in Ethiopian healthcare facilities often lack comprehensive information regarding the likelihood of symptom persistence or the emergence of new symptoms post-laparoscopic cholecystectomy (LC), from admission to discharge. Furthermore, there exists a pressing need to examine PCS diagnosis, management strategies, and the adequate monitoring of patients post-surgery to ensure favorable symptomatic outcomes. However, the limited resources in Ethiopia pose a substantial barrier, as the costs associated with such interventions are prohibitive.

2.2 Statement of the problem

Postcholecystectomy syndrome (PCS) poses a significant clinical dilemma characterized by the persistence or emergence of symptoms after the surgical removal of the gallbladder. Despite advancements in surgical methodologies and perioperative treatment, a subgroup of individuals continues to endure symptoms like abdominal pain, dyspepsia, and gastrointestinal discomfort. The etiology, prevalence, risk factors, and optimal therapeutic regimens for PCS are not thoroughly comprehended, resulting in diverse clinical consequences and patient discontent. Hence, there exists an urgent necessity for a thorough investigation to elucidate the fundamental mechanisms of PCS, recognize prognostic indicators, and formulate efficient treatment strategies to enhance patient outcomes and well-being.

2.3 Significance of the study

Understanding the mechanisms behind PCS is key to developing targeted interventions that improve patient outcomes. Persistent PCS symptoms lead to frequent healthcare use, including outpatient visits, diagnostics, and hospitalizations. Addressing contributing factors and implementing effective treatments can optimize resource utilization and reduce system strain. PCS negatively impacts quality of life and patient satisfaction. Identifying ways to alleviate symptoms can improve satisfaction and overall outcomes. Identifying modifiable risk factors can aid in preoperative counseling and better patient selection. Enhancing surgical techniques and perioperative care can minimize complications, reduce PCS risk, and improve surgical outcomes.

3. Literature review

A 2018 British systematic review examined the causes and treatment of post-cholecystectomy syndrome (PCS) by analyzing 21 studies, including 15 case series, 2 cohort studies, 1 case-control study, and 3 randomized controlled trials (RCTs). The studies involved both male and female participants, with a higher proportion of females. Participants' ages ranged from 41 to 62 years. Within the first three years after cholecystectomy, gastric conditions such as peptic ulcer disease (PUD), hiatal hernia, and gastroesophageal reflux disease (GERD) were the most frequent causes of PCS, appearing in 11-100% of cases. Beyond three years, retained biliary stones were the primary cause, affecting 4-40% of participants. Sphincter of Oddi dysfunction (SOD) was responsible for 1.8-31% of PCS cases in a general population, while 4.1-50% of cases had no identifiable cause. Three RCTs explored medical treatments: Bouzo et al. and Farup et al. studied cisapride, while Khuroo et al. investigated nifedipine. Treatment effectiveness varied depending on the underlying cause. For example, cisapride was found to alleviate symptoms in Bouzo et al.'s study, whereas Khuroo et al. focused on nifedipine's effects. Cicala et al. conducted a subgroup analysis on SOD patients, offering sphincterotomy to those with prolonged hepatic-hilar duodenal transit time. Patients who underwent sphincterotomy experienced significantly fewer recurrent symptoms compared to those managed conservatively. (17)

A prospective cohort study analyzed data from 1,374 patients diagnosed and surgically treated for gallstone disease (open or laparoscopic). Of these, 272 patients were readmitted or managed as outpatients for PCS between January 2000 and December 2013 at Al Ansar General Public Health Hospital in Medina, Saudi Arabia. The PCS incidence rate was 19.8%, with a male-to-female ratio of 1:1.45 and a mean age of 37.41±7.12 years. Common symptoms included right upper quadrant abdominal pain (72.4%), nausea (50.7%), vomiting (33.5%), dyspepsia (30.5%), abdominal colic (23.5%), and fever (13.6%). Physical signs included right upper quadrant tenderness (45.9%), jaundice (17.6%), generalized abdominal tenderness (14.3%), and epigastric tenderness (8%). Of the 272 patients, 49.3% were admitted electively, while 50.7% came through the emergency department. Laboratory findings included elevated liver enzymes (26.8%), high bilirubin (17.3%), positive Helicobacter pylori serology (15.8%), elevated alkaline phosphatase (12.5%), high amylase (11.4%), and increased white blood cell count (9.9%). Ultrasound detected retained common bile duct (CBD) stones in 8% of patients, recurrent CBD stones in 9.6%, dilated CBD in 8.8%, bile leakage in 6.98%, free intraperitoneal fluid in 6.6%, and cystic duct stump remnants in 4%. CT scans revealed pancreatitis in 15.4% of patients, dilated intrahepatic ducts in 9.6%, free intraperitoneal fluid in 8.5%, and narrowing of the supra-pancreatic common duct in 3.3%. ERCP identified sphincter of Oddi stenosis in 4.4%, cystic duct stump syndrome in 4%, and CBD stricture in 1.8%. Upper gastrointestinal

endoscopy diagnosed peptic ulcer disease in 15.1% of patients. The most common causes of PCS were no identifiable cause (18.4%), Helicobacter pylori infection (15.8%), pancreatitis (15.4%), peptic ulcer disease (15.1%), recurrent CBD stones (9.6%), retained CBD stones (8.1%), bile leakage (7%), sphincter of Oddi stenosis (4.4%), cystic duct stump syndrome (4%), and CBD stricture (1.8%). No mortality was reported. (18)

An Indonesian cross-sectional study in 2018 aimed to identify risk factors for PCS by retrospectively analyzing medical records and conducting patient interviews at Cipto Mangunkusumo Hospital. Patients who underwent additional procedures, had bile duct or intrahepatic stones, or lacked sufficient data were excluded. Data on patient characteristics, preoperative symptoms, PCS awareness, and postoperative conditions were collected. Preoperative symptoms were assessed using the Rome III criteria, and patients were questioned about their knowledge of PCS. Postoperative conditions were evaluated at least six months after surgery. Statistical analysis using SPSS 22.0 revealed a PCS incidence of 45.5% among 112 laparoscopic cholecystectomy patients. Multivariate logistic regression identified preoperative flatulence ($P \leq 0.001$, OR = 17.152), nonspecific preoperative symptoms ($P = 0.012$, OR = 3.984), and poor preoperative awareness of PCS ($P = 0.003$, OR = 5.907) as independent predictors of PCS. A strong correlation was found between patient awareness and preoperative education ($P \leq 0.001$, OR = 69.00). The study concluded that preoperative flatulence, nonspecific symptoms, and inadequate awareness increased PCS risk. It recommended upper GI endoscopy for nonspecific symptoms not meeting Rome III criteria and emphasized the importance of preoperative education to reduce PCS incidence. (19)

A retrospective cross-sectional study at Military Hospital Rawalpindi, Pakistan, from January 2014 to December 2015, included 626 patients who underwent elective open cholecystectomy. Patients with a history of pancreatitis, pancreatic tumors, hepatitis, acid peptic disease, or prior biliary surgeries were excluded. Initial screening involved abdominal ultrasound and liver function tests. Patients with CBD stones, dilated or narrowed CBD underwent ERCP, while those suspected of malignancy had triphasic CT and endoscopic ultrasound (EUS). Of the 626 patients, 101 (16.1%) were diagnosed with PCS, with a mean age of 45±20 years. Females were more predisposed to PCS (18.73%) than males (11.68%). Nine patients presented with jaundice and abnormal liver function tests, with six experiencing right hypochondrial pain. Retained stones were found in four patients, treated via ERCP or choledochotomy, while two had biliary strictures treated with stenting or hepaticojejunostomy. (20)

A prospective cross-sectional study at GND Government Hospital in Punjab, India, from 2008 to 2011, included 100 patients (85 females, 15 males) operated on for gallbladder disease. Ultrasound revealed

cholelithiasis in 98% of cases, sludge with stones in 4%, sludge alone in 2%, and pathological gallbladder without stones in 2%. Seven cases had choledocholithiasis, and one had CBD dilation without stones. Mucocele was present in 7% and empyema in 1%. Acute cholecystitis was found in 5% of cases. Most patients were in their fourth or fifth decade, with 95 undergoing open cholecystectomy and 5 laparoscopic. Seven patients had bile duct exploration for stone removal. Follow-ups at 2, 4, and 6 months showed PCS symptoms in 27% of patients, primarily related to the hepatobiliary system. (21)

A longitudinal study at Jawaharlal Nehru Institute of Medical Sciences (JNIMS), Imphal, Manipur, from September 2019 to August 2021, aimed to determine PCS incidence and associated factors in laparoscopic cholecystectomy patients. The study included patients over 18 with gallbladder stone disease confirmed by ultrasound or MRCP, excluding those with CBD stones, cholangitis, choledochal cysts, or prior abdominal surgery. The mean age was 39.11±13.82 years, with 82.67% females. Preoperative symptoms included abdominal pain (95.34%), nausea (67.34%), bloating (32.7%), vomiting (23.34%), and urticaria (7.34%). Intraoperative findings included adhesions (27.34%), impacted stones (12%), stone spillage (8%), and bile spillage (10.67%). The mean operation time was 49.10±11.31 minutes, with most surgeries lasting 45-50 minutes. The mean hospital stay was 4.13±0.698 days. Among 27 PCS cases, gastritis was the primary cause (11.12%), while 77.78% had no identifiable cause. Follow-ups at 2 weeks, 1 month, 3 months, and 6 months postoperatively showed no significant differences in gender, age, or BMI distribution between PCS and non-PCS groups. However, jaundice ($\chi2 = 4.912$, $p = 0.027$) and history of acute attacks ($\chi2 = 8.063$, $p = 0.005$) were significant predictors of PCS. Stone spillage ($\chi2 = 9.049$, $p = 0.003$), bile spillage ($\chi2 = 8.046$, $p = 0.005$), and CBD dilation ($\chi2 = 11.338$, $p = 0.001$) were also significant. Postoperative nausea and flatulence at 3 and 6 months were significantly associated with PCS. (22)

An Ethiopian cross-sectional retrospective study at Tibebe Ghion Teaching Specialized Hospital in 2020 analyzed 173 cholecystectomies (open and laparoscopic) over two years. Females comprised 76.3% of patients, with a male-to-female ratio of 1:3.2. The mean age was 41.82 years, and the average postoperative stay was 3.85 days, extending to 7 days for emergency cases. Complications occurred in 11.6% of patients, with surgical site infections being the most common (71%). Laparoscopic cholecystectomy and emergency procedures had higher complication rates. (23)

4. Objectives

4.1 General

1. To investigate the prevalence, etiology, and associated factors of postcholecystectomy syndrome in patients who underwent cholecystectomy.

4.2 Specific

1. Determine the prevalence of PCS in patients undergoing cholecystectomy at Zewditu Memorial Hospital.

2. Identify the risk factors associated with the development of PCS, including demographic, clinical, and surgical variables.

3. Characterize the clinical manifestations of PCS experienced by affected individuals.

4. Assess the impact of PCS on patient-reported outcomes, including quality of life, emotional well-being, & healthcare utilization.

5. Methods

5.1 Study area

Zewditu Memorial Hospital, Addis Ababa, Ethiopia

5.2 Study design

This study is an institution-based retrospective study that was conducted by reviewing patients' medical records and interview questions via telephone.

5.3 Source population and study population

All patients who underwent both elective and emergency cholecystectomies from January 2023 to December 2023.

5.4 Sample size estimation

During that year 340 pts were operated. The largest PCS was from the Indonesian study (45.5%) and the p was 0.455 and the q was 0.564. n = Z^2 * pq/E^2 = 1.962*0.455*0.564/0.052 = 394. Since n > the source population, I used the correction formula: and 10% nonrespondense rate

Final sample size = 210 $n_{final} = F \times n$
where
$F = \frac{1}{1 + (n/N)}$
N is the population size
n is the sample size before adjustment

Systematic random sampling technique was utilized.

5.5 Inclusion criteria

1. Patients who underwent cholecystectomy and who are willing to telephone interview.

5.6 Exclusion criteria

1. Below 18 years of age or above 80 years of age
2. Documented history of inflammatory bowel disease, irritable bowel syndrome (IBS), or other chronic gastrointestinal disorders before cholecystectomy.
3. Documented symptoms attributed to non-biliary causes such as peptic ulcer disease, gastroesophageal reflux disease (GERD), or pancreatic disorders.
4. Severe comorbidities such as end-stage renal disease, advanced liver disease (e.g., cirrhosis), or malignancy.

5. Significant psychiatric disorders such as major depressive disorder or generalized anxiety disorder.

5.7 Operational definitions

Presence of PCS Symptoms: a binary outcome indicating whether a patient exhibits symptoms characteristic of PCS (e.g., abdominal pain, dyspepsia, bloating, diarrhea) following cholecystectomy. It may be measured through patient self-report, medical records, or clinician assessment.

Duration of PCS Symptoms: measures the duration of PCS symptoms following cholecystectomy. It can be the time elapsed (in months or years) since surgery until the resolution or persistence of PCS symptoms.

Healthcare Utilization: assesses patients' healthcare utilization patterns related to PCS. It can be operationalized as the frequency of outpatient visits, emergency department visits, hospitalizations, or procedures (e.g., endoscopies, and imaging studies) for PCS-related symptoms or complications.

Surgical Factors: investigates surgical factors associated with PCS development or outcomes. It can include variables such as surgical technique (laparoscopic vs. open cholecystectomy), intraoperative complications, and postoperative complications (e.g., bile duct injury, bile leak).

Comorbidities: assesses the presence of comorbid medical conditions that may impact PCS outcomes. It can include variables such as diabetes, obesity, cardiovascular disease, hypertension, asthma, and HIV AIDs, which may interact with PCS symptoms or complicate management.

5.8 Study Variables

5.8.1 Independent variables

Patient Characteristics: Age at the time of cholecystectomy, Gender, Preoperative symptoms (e.g., presence of gallstones, biliary colic), Comorbidity

Type of Cholecystectomy: Laparoscopic or open cholecystectomy

Intraoperative findings: Stone number, GB distension, CBD dilatation, Adhesion, Bile spillage

5.8.2 Dependent variables

Presence of PCS Symptoms, Healthcare Utilization, Psychosocial Impact, Work Productivity/impact on daily activity

5.9 Data collection method and procedure

Data was be collected during working hours and this was conducted by three personnel for an estimated 6 months in Zewditu Memorial Hospital. We reviewed electronic or paper-based medical records of patients who have undergone cholecystectomy and additional interview questions was used which was delivered via telephone.

5.10 Data management and analysis

The data collected was coded and entered into a computer using SPSS version 26 for analysis and interpretation. Descriptive and inferential (linear regression) analysis were implemented to explore and determine the relationship between predictors on outcome variables.

5.11 Data Quality Control Measures

After carefully adopting other published journal articles into our current context, structured questions have been drafted. The Questionnaire was checked thoroughly if it was complete, objective, and variable based. Before entering the data into computer software for analysis, it was thoroughly reviewed to ensure consistency and completeness. A one-day training session was conducted for data collectors prior to the start of data collection. The session focused on clarifying the meaning of each question, the process of obtaining informed consent, maintaining the confidentiality of collected information, and ensuring the overall quality of data collection. Special emphasis was placed on understanding the importance and precise meaning of each question, as well as how to communicate them effectively to participants in clear and understandable terms when necessary.

5.12 Ethical Consideration

Approval from the research ethics committee at Addis Ababa University's Faculty of Medicine was secured prior to the commencement of data collection.The objective of the study and its implication for the community was explained.

The respondents were briefly informed about the study which assures that participation was going to be voluntary. Verbal consent was to be obtained from each participant. At the same time, they were informed that confidentiality would be maintained throughout the data collection, the entire study period, and beyond. Respondents who wouldn't be comfortable with the interview would be given the right not to be involved in the study.
To ensure the confidentiality of participants, code numbers were assigned in place of personal identifiers. All questionnaires were securely sealed following data collection in each department. Upon completion of data entry, the questionnaires were stored in a locked location and ultimately destroyed once the study concluded.

5.13 Data dissemination and utilization of results

The results of this research will be submitted to the School of Medicine. It will also possibly be presented to a medical journal for publication.

6. Result

A total of 210 cases were included in this study during the study period who qualified for the inclusion criteria:

Age Distribution: The mean age of patients in this study was 40.19 ± 12 years and the median was 37 years. Patients in the study ranged from 18 years to 74 years. Maximum number of patients were from the age group of 30-39 years (38.6%), followed by 40-49 years (21.4%), 20-29 years (16.7%), 50-59 (12.4%) and the lowest number of patients were above 60 years (10%) and below 20 years (1%). (Figure 1).

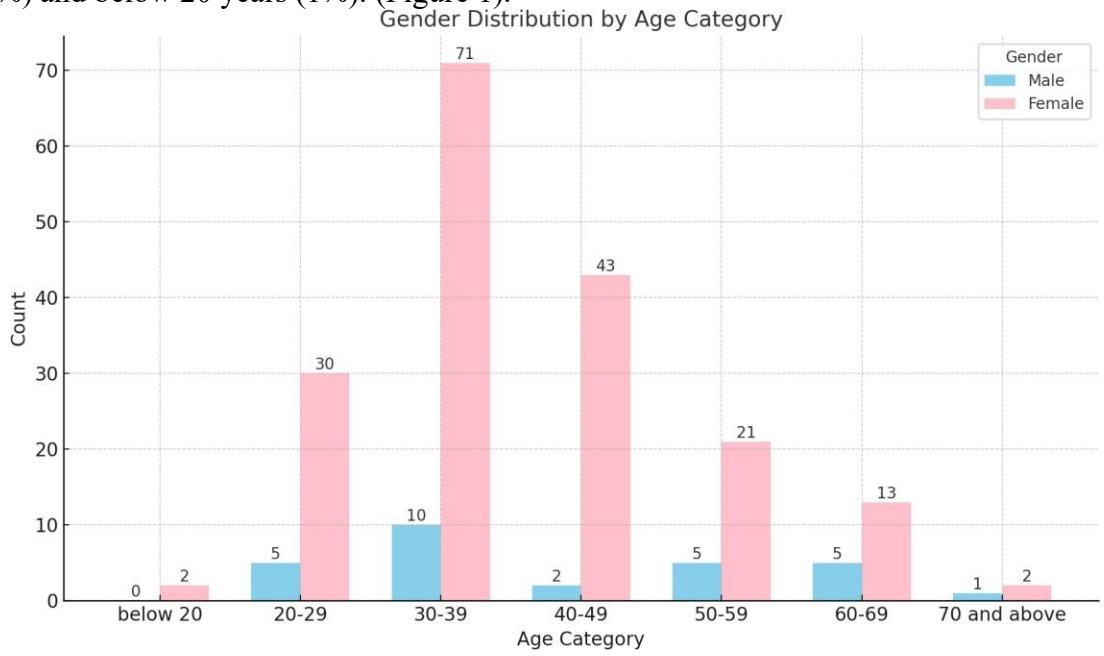

Figure 1: The bar graph depicts the distribution in terms of patients age

Gender Distribution: This study involved both genders, however, there was a greater number of female patients 182 (86.7%). The number of male patients was 28 (13.3%) (Table 1).

Table 1: Distribution of the patients in terms of gender (n = 210)

	Frequency	**Percent**
Male	28	13.3
Female	182	86.7
Total	210	100

Preoperative presenting symptoms: In the study, about 92.8% of patients complained of abdominal pain while 72.4% had fatty meal intolerance. Nausea was observed in 50.5% of patients and 45.2% had vomiting. Bloating of the abdomen and heartburn were observed in 21% & 39% of patients respectively. Only 14.3% & 4.3% of patients had a history of acute cholecystitis & jaundice respectively. (Figure 2).

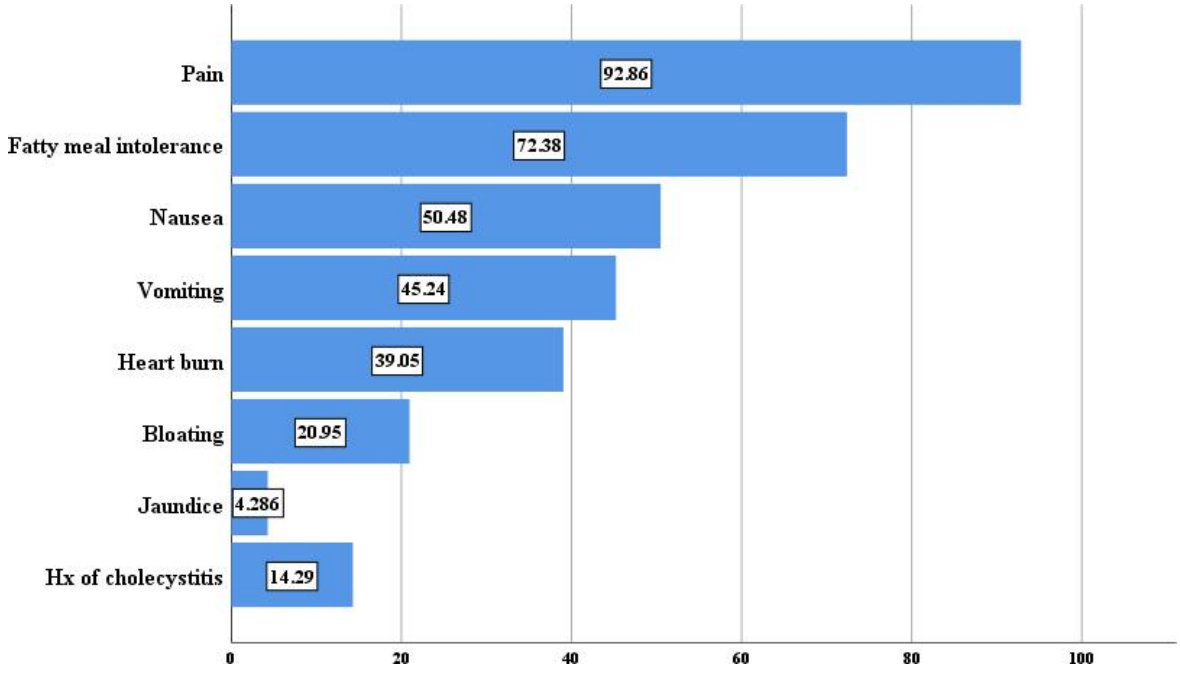

Figure 2: The bar chart depicts the distribution of patients in terms of symptoms.

Comorbidity

- **Hypertension** was the most frequently reported comorbidity, contributing to 12.4% of responses and 12.9% of cases.
- **HIV** represented 5.1% of responses and 5.2% of cases.
- **DM (Diabetes Mellitus)**, and **HBV, Asthma, CTMNG, and Disc Prolapse** each accounted for 4.1% of responses, with corresponding case percentages of 4.3%. (Figure 3)

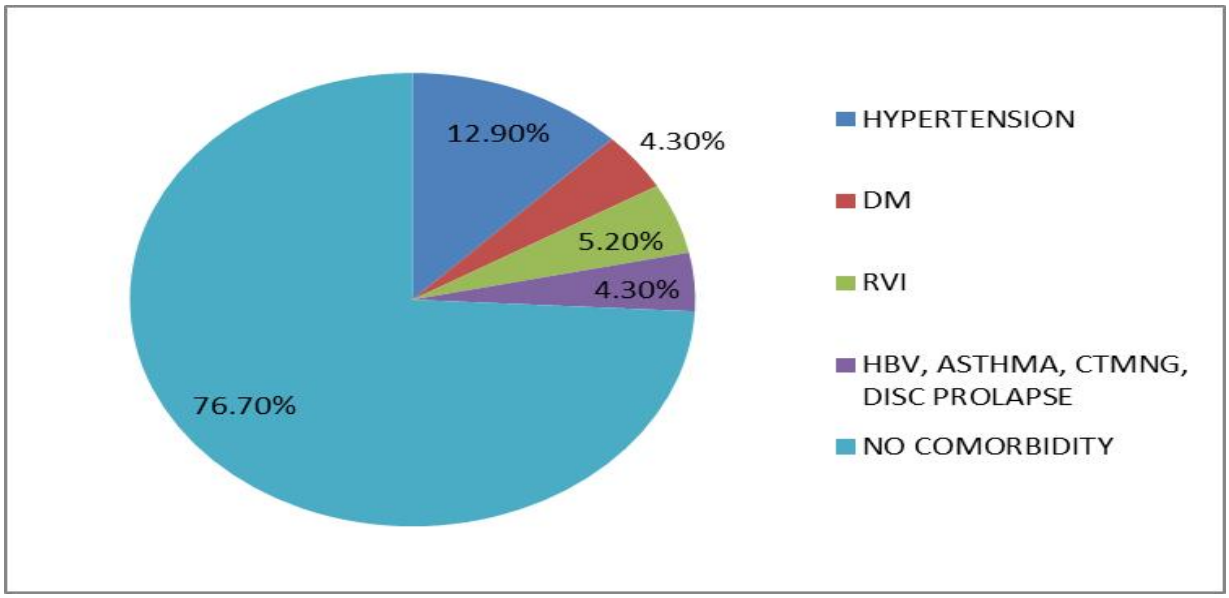

Figure 3: The pie chart depicts the distribution of patients in terms of comorbidity.

Surgical setting and Operative approach

Open Procedure: Male: 13.2% of patients undergoing this procedure were male. Female: A significant majority, 86.8%, were female. **Laparoscopic Procedure**: Male: 15.0%. Female: 85.0%, again representing the majority. **CBD Exploration**: Male: 33.3%, representing the highest male percentage among all procedures. Female: 66.7%.

Elective Admission: Male: 13.6%. Female: 86.4%. **Emergency Admission**: Male: 8.3%, the lowest percentage of males among all categories. Female: 91.7%, the highest percentage of females across admission types. (Table 2, figure 4)

Intraoperative findings: In this study, intraoperative findings during surgery included adhesion (22.5%) and bile leak/stone spillage (11%) (Table 3, Figure 5). Contracted gall bladder size is seen in 66%, and 6.5% had dilated common bile duct (CBD) (Figure 7). The number of gall bladder stones varied, 26.5% of patients had single stones while 71.5% had multiple stones and 2% had no stone detected inside the GB. (Table 3, Figure 6)

Table 2: Gender distribution by type of procedure and mode of admission (N = 210)

		Type of procedure			Mode of admission	
		OPEN	**LAPAROSCOPIC**	**CBD exploration**	**Elective**	**Emergency**
Gender	**MALE**	25	3	3	27	1
	FEMALE	165	17	6	171	11
Total		190	20	9	198	12

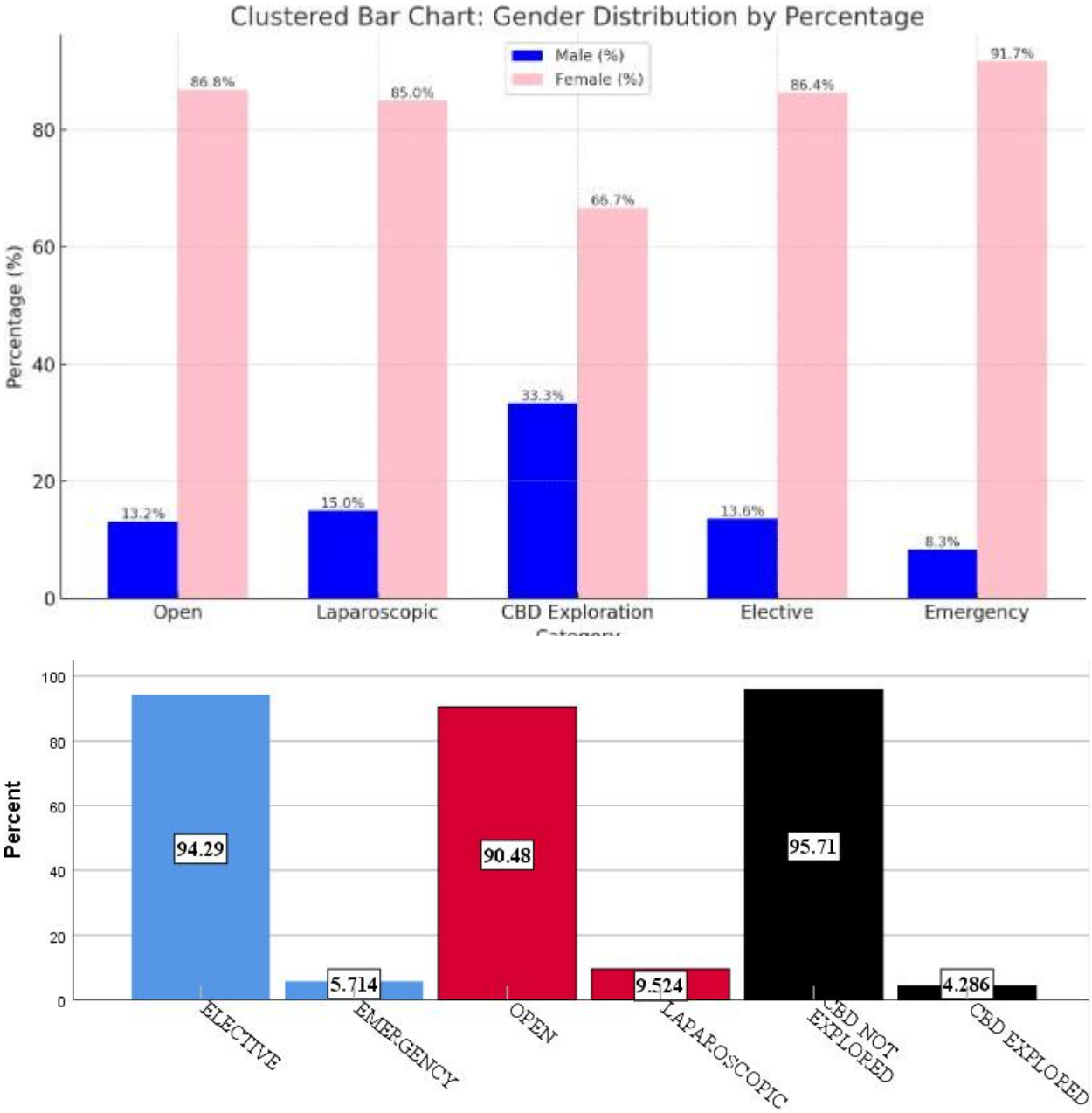

Figure 4: Bar chart distribution of operative approach and surgery setting (N: 210)

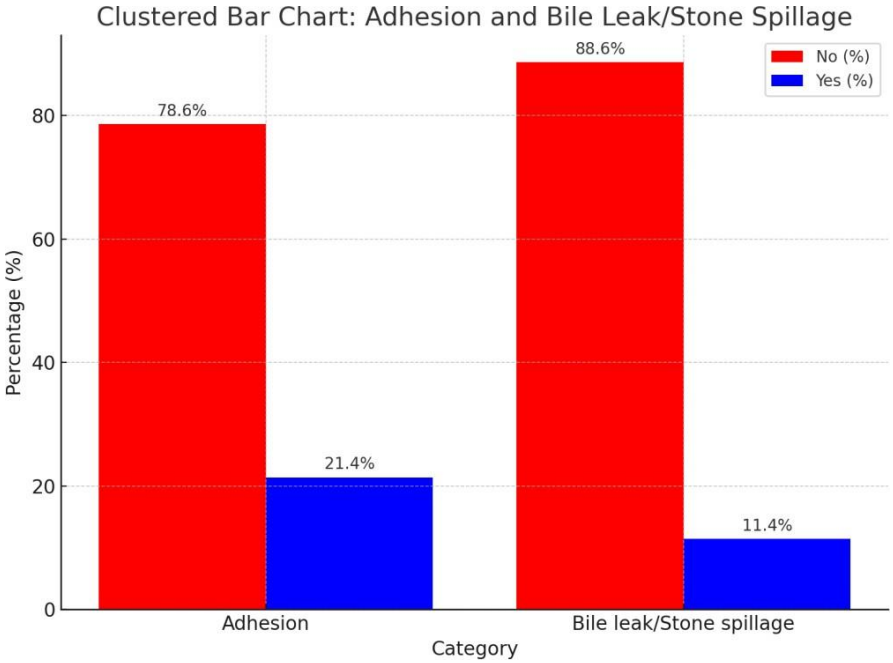

Figure 5: The bar chart depicts the distribution of patients in terms of the presence of Intraoperative findings.

Table 3: Intraoperative findings and number of stone distribution of the patient (n = 200)

	GB distension		**CBD dilatation**		**Stone**
Distended	142 (67.6%)	**No**	197 (93.8%)	Single	56 (26.7%)
Contracted	68 (32.4%)	**Yes**	13 (6.2%)	Multiple	150 (71..4%)
				None	4 (1.9%)
Total	210 (100%)		210 (100%)		210 (100%)

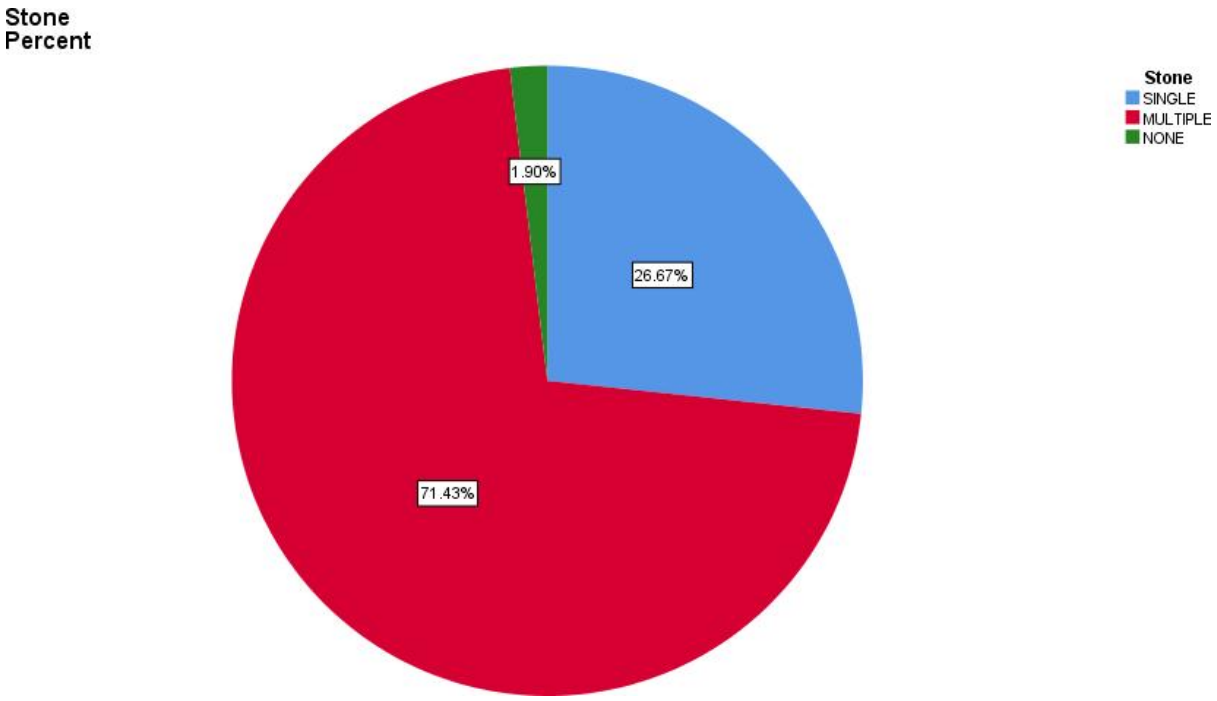

Figure 6: The pie chart depicts the distribution of patients in terms of number of gallbladder stones.

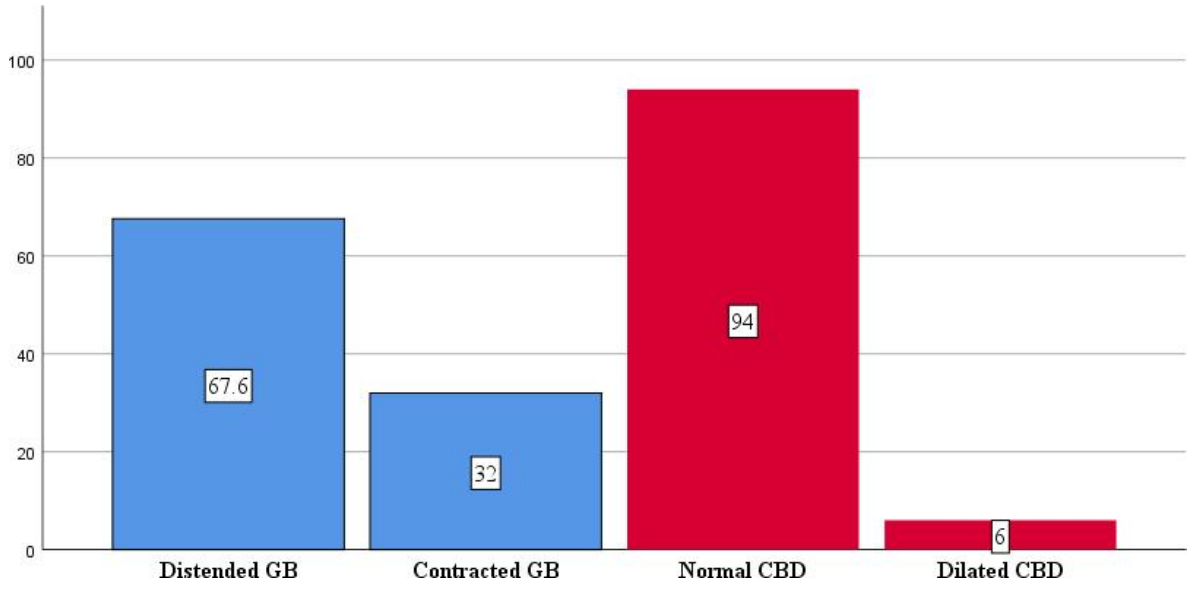

Figure 7: The bar chart depicts the distribution of patients in Terms of patient condition during Intraoperative findings.

PCS: Approximately one-third of participants 70 (33.3%) experienced post-cholecystectomy syndrome, while the majority 140 (66.7%) did not report symptoms. (Figure 8)

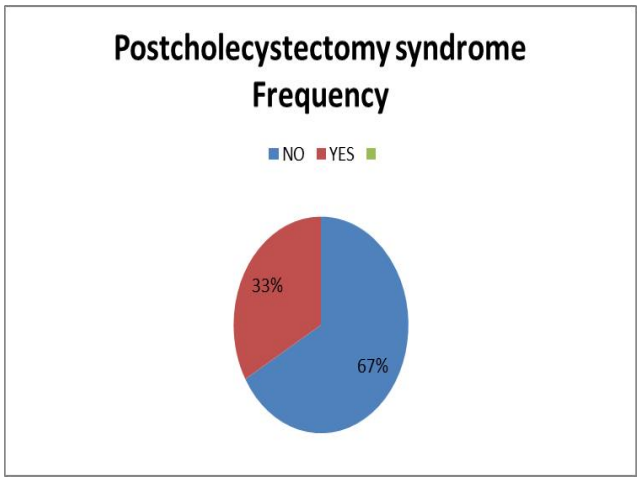

Figure 8. Frequency and percentage of postcholecystectomy syndrome among participants (N = 210).

Patients with complaints lasting less than 6 months had slightly a higher percentage of no syndrome (68.8%) compared to those with more than 6 months (65.4%). Conversely, the percentage of patients reporting post-cholecystectomy syndrome was slightly higher in the group with complaints exceeding 6 months (34.6%) compared to those with complaints lasting less than 6 months (31.2%). (Table 4)

Table 4: presence of PCS in terms of preoperative duration of complaints

		Post-cholecystectomy syndrome		
		NO	YES	Total
Preoperative duration of complaints	less than 6 months	53	24	77
	more than 6 months	87	46	133
	Total	140	70	210

Pain is the most frequently reported symptom, accounting for 25.7% of patients. Nausea follows as the second most reported symptom, comprising 23.3% of patients. Fatty meal intolerance accounts for 21.0% of patients. Heartburn represents 18.6% of the cases. Bloating of the abdomen & Vomiting is reported by 12.9 & 7.6% of patients respectively. Jaundice is

the least common symptom, reported by only 5.2% of patients. (Figure 9). Patients were most commonly present with the syndrome within the first 3 months (47.1%) of the surgery followed by 32.9% & 20% three to 6 months, and 6 months later after the surgery. (Table 5)

Table 5: Timing of PCS from the surgery

		Timing from surgery (MONTHS)		
		LESS THAN 3 MONTHS	WITHIN 3 TO 6 MONTHS	MORE THAN 6 MONTHS
PCS	YES	33	23	14

Postoperative healthcare utilization

The majority (66.7%) reported visiting a healthcare provider 1-2 times, while 33.3% reported more frequent visits (>3 times). Most patients (92.9%) did not visit the Emergency Outpatient Department (EOPD), while only 7.1% did. A large proportion (80.5%) did not undergo additional tests, compared to 19.5% who did. 79% were not prescribed new medications, whereas 21% reported receiving new prescriptions. Only 68.6% felt their healthcare needs were fully addressed, while 31.4% expressed unmet needs. (Figure 10)

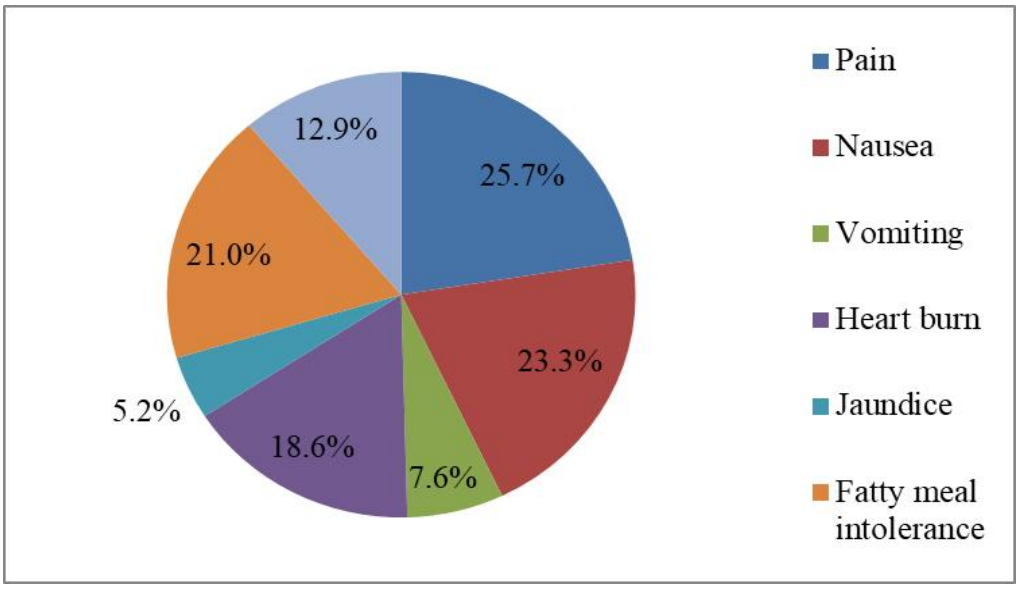

Figure 9: The pie chart depicts the distribution of patients in Terms of PCS

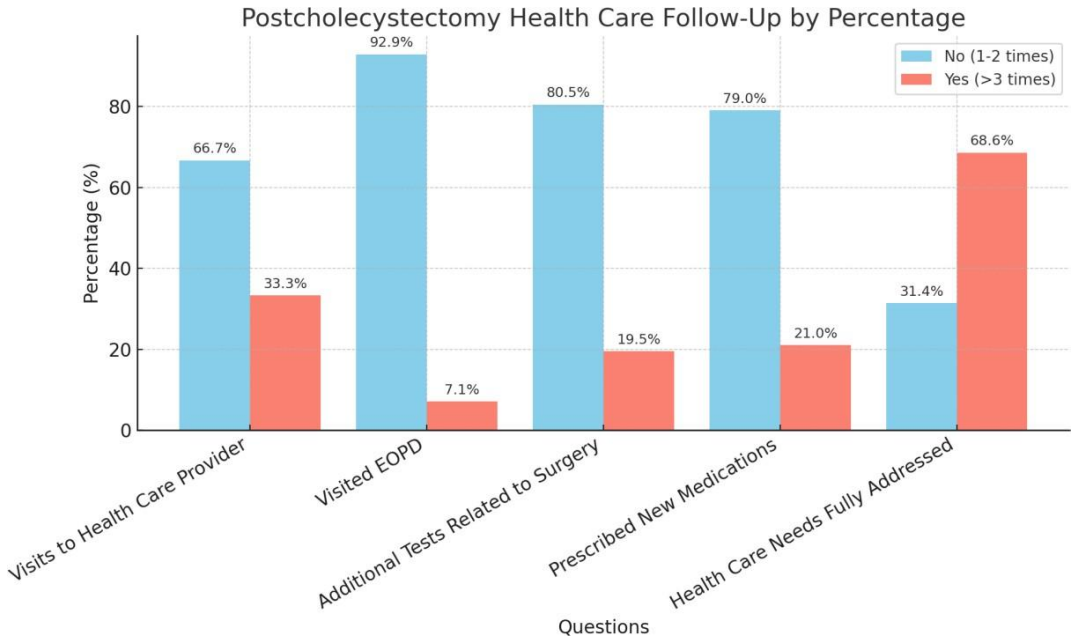

Figure 10: Healthcare utilization in postoperative patients

Postoperative emotional well-being and daily activity

A majority of participants did not experience stress or frustration (67.6%) or limitations in daily activities (68.1%). About 19% of participants reported slight stress/frustration and slight limitations in daily activities. Moderate responses were low, with 8.6% for stress/frustration and 8.1% for limitations in daily activities. Only 4.8% of participants reported significant stress or frustration, and an identical percentage (4.8%) noted significant limitations in daily activities. (Table 6)

Table 6: Emotional well-being and limitation of daily activity in post-cholecystectomy patients

	Experienced Stress/Frustration (%)	**Limited Daily Activities (%)**
Not at all	67.6	68.1
Slightly	19	19
Moderately	8.6	8.1
Significantly	4.8	4.8

Overall satisfaction

The results showed that the majority of patients were either **very satisfied** (54.8%) or **satisfied** (24.8%), accounting for a combined 79.5% of the sample. A smaller proportion of patients were **neutral** (11.9%) regarding their satisfaction, while **8.6%** of patients reported being **dissatisfied** (Figure 11).

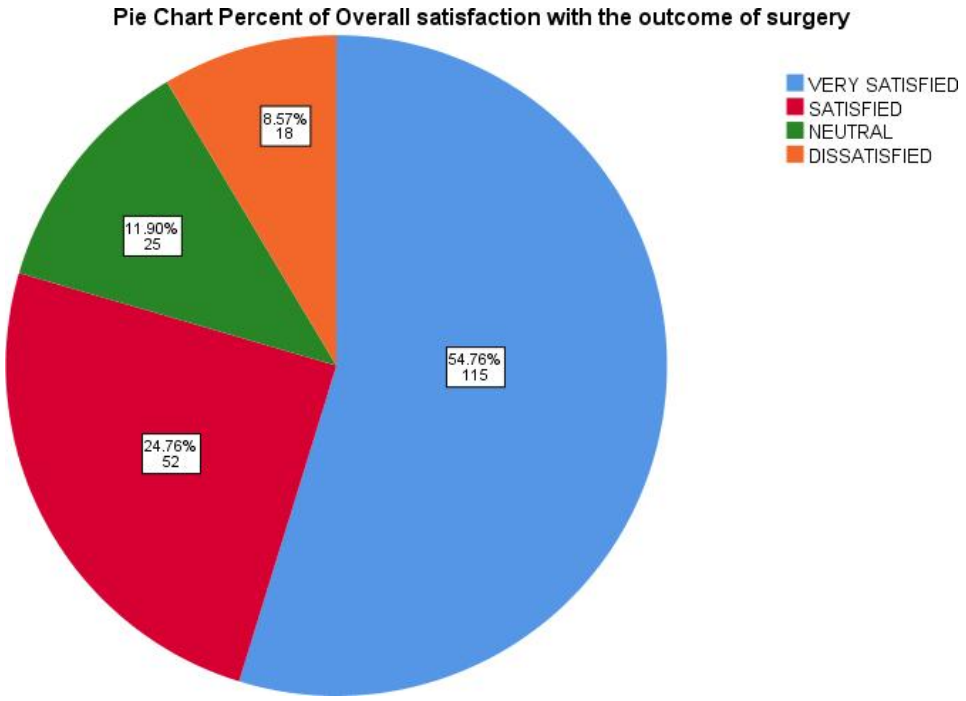

Figure 11: Pie chart depicts post-operative overall satisfaction

Multiple linear regression was conducted to predict the likelihood of post-cholecystectomy **syndrome** based on several independent variables, including age category, gender, duration of complaints, symptoms (e.g., pain, nausea), comorbidities (e.g., hypertension, diabetes), and surgery-related factors (e.g., type of procedure, bile duct exploration). **Age Category**: Age was a significant positive predictor of post-cholecystectomy syndrome, B=0.082, t(210) =2.861, p=0.005. This suggests that an increase in age category is associated with a higher likelihood of developing the syndrome. **Jaundice**: The presence of jaundice significantly predicted post-cholecystectomy syndrome, B=0.727,t(210)=2.050,p=0.042, indicating that patients with jaundice are more likely to report the syndrome. The rest of the factors such as gender, duration of Complaints, preoperative symptoms (e.g., pain, heartburn, nausea), comorbidities, surgery

setting, operative approach, and intraoperative findings were not significant predictors. (Table 7-9)

Table 9: Association of variables and PCS (N: 210)

	Predictor	B	SE B	β	t	p
	(Constant)	0.029	1.607	—	0.018	0.986
Demographic characteristics	Age Category	0.082	0.029	0.216	2.861	0.005*
	Gender	-0.141	0.102	-0.1	-1.379	0.17
Preoperative symptoms	Duration of complaints	0.081	0.072	0.083	1.127	0.261
	Pain	0.135	0.147	0.074	0.919	0.359
	Heartburn	0.05	0.073	0.051	0.684	0.495
	Nausea	0.085	0.069	0.09	1.226	0.222
	Vomiting	-0.074	0.068	-0.078	-1.081	0.281
	Fatty meal intolerance	0.011	0.081	0.01	0.136	0.892
	Bloating	0.128	0.087	0.11	1.471	0.143
	Jaundice	0.727	0.355	0.313	2.05	0.042*
	History of cholecystitis	0.015	0.104	0.012	0.15	0.881
Comorbidities	Hypertension	-0.027	0.259	-0.019	-0.103	0.918
	Diabetes Mellitus (DM)	-0.227	0.228	-0.092	-0.997	0.32
	RVI	0.164	0.302	0.077	0.542	0.588
	HBV, ASTHMA, CTMNG, DISC PROLAPSE	0.176	0.28	0.076	0.629	0.53
	No Comorbidity	0.041	0.276	0.037	0.15	0.881
Surgery setting	Emergency/Elective	-0.028	0.15	-0.014	-0.189	0.85
Operative approach	Open/Laparoscopic	-0.164	0.119	-0.102	-1.374	0.171
	CBD Exploration	-0.526	0.444	-0.226	-1.186	0.237
Intraoperative findings	Stone	0.083	0.071	0.083	1.174	0.242
	Gallbladder Distension	0.047	0.072	0.047	0.653	0.514
	CBD Dilatation	0.019	0.242	0.01	0.077	0.939
	Adhesion	0.11	0.084	0.095	1.305	0.193
	Bile Leak/Stone Spillage	0.069	0.11	0.047	0.627	0.531

Note: B = Unstandardized Coefficients; SEB = Standard Error; β = Standardized Coefficients.

*Significant predictors at $p<0.05$.

Table 7: Presence of PCS and preoperative variables (N: 210)

		Post-cholecystectomy syndrome	
		NO	YES
Gender	MALE	15	13
	FEMALE	125	57
Age Category	below 20	1	1
	20-29	26	9
	30-39	58	23
	40-49	30	15
	50-59	18	8
	60-69	7	11
	70 and above	0	3
Pain	NO	9	6
	YES	131	64
Heartburn	NO	90	38
	YES	50	32
Nausea	NO	73	31
	YES	67	39
Vomiting	NO	73	42
	YES	67	28
Fatty meal intolerance	NO	39	19
	YES	101	51
Bloating	NO	115	51
	YES	25	19
Jaundice	NO	137	64
	YES	3	6
Hx of cholecystitis	NO	119	61
	YES	21	9
HYPERTENSION	NO	122	61
	YES	18	9
DM	NO	132	69
	YES	8	1
RVI	NO	134	65
	YES	6	5
HBV, ASTHMA, CTMNG, DISC PROLAPSE	NO	136	65
	YES	4	5
NO COMORBIDITY	NO	30	18
	YES	109	52

Table 8: PCS and intraoperative findings (N: 210)

		Post-cholecystectomy syndrome	
		NO	YES
Emergency/Elective	ELECTIVE	131	67
	EMERGENCY	9	3
Open/Lap	OPEN	124	66
	LAPAROSCOPIC	16	4
Common bile duct exploration	NO	136	65
	YES	4	5
Stone	SINGLE	42	14
	MULTIPLE	97	53
	NONE	1	3
GB Distension	Distended	98	44
	Contracted	42	26
CBD dilatation	NO	133	64
	YES	7	6
Adhesion	NO	115	50
	YES	25	20

Possible cause of PCS

On average follow-up of 10 months (6-20 months) totally 140 (67%) out of 210 patients were relieved from preoperative symptoms following cholecystectomy. However, 70 (33%) patients complained of persistent symptoms. Most of the patients who underwent cholecystectomy were routinely followed up with no significant abnormal findings in the surgical site. The cause of postoperative persistent symptoms following cholecystectomy might be complex. Some other concomitant disorders could cause similar symptoms, which might be confused with gallstone symptoms before surgery and then lead to no relief of symptoms after surgery. Fatty liver disease (2), Bile reflux (2), gastritis (3), bile leak (2), retained bile duct stone (2), biliary stricture (1), GB adenocarcinoma (1), liver metastasis (1), abdominal wall pain (intercostal

neuritis) (5), and incisional hernia (3) might be potential causes of postoperative symptoms. Moreover, there were still 48 patients presented with both preoperative and postoperative symptoms, the cause of which remained unknown.

7. Discussion

Gallstones are a significant public health issue in developed societies. In the United States, it represents a substantial health issue affecting 10-15% of the adult population (1,2). Across Asia, the frequency of gallstone disease ranges from 5-10%, particularly prevalent among females and the elderly. In India, the estimated prevalence falls between 2-29% (24). A multicenter ultrasonography study conducted in Nepal revealed an overall prevalence of 4.87% (25). In a 2013 study conducted at Ayider Referral Hospital in Ethiopia, 225 patients were included, with individuals aged 30 to 49 years comprising half of the sample. Additionally, over two-thirds (71.6%) of the patients were female (8). Similarly, a 2018 study at St Paul Millennium Medical College Hospital in Ethiopia reported a gallstone prevalence of 10.2%, with women accounting for 72.7% of the cases. In India, a prospective cross-sectional study conducted at GND Government Hospital, Punjab, between 2008 and 2011, found that among 100 patients undergoing gallbladder surgery, 85% were female and 15% were male. These findings are consistent with the results of our study, where 85% of the affected patients were female, yielding a male-to-female ratio of 1:6.5 and more than 60% of the patients were in the age group of 30-49.

Cholelithiasis often presents with a range of symptoms, with the most frequent being recurrent episodes of pain, known as biliary colic, typically located in the right upper abdominal quadrant or the epigastric region. In our study, abdominal pain was the most commonly reported symptom, affecting 92.8% of patients, while 72.8% experienced intolerance to fatty meals. Most patients (63.3%) have complaints lasting more than 6 months. Similarly, studies conducted at Ayder Referral Hospital and Tikur Anbessa Specialized Hospital (TASH) also identified right upper quadrant pain as the predominant symptom, accounting for 74.7% and 96% of cases, respectively.

In this study, 12.9% of the patients were identified as having at least one underlying medical comorbidity. Hypertension was the most prevalent condition among them, followed by HIV and diabetes, which were also commonly observed.

Globally, approximately 90% of cholecystectomies are performed laparoscopically, making laparoscopic cholecystectomy the gold standard for managing cholelithiasis. However, a 2014 study conducted in Addis Ababa reported that open cholecystectomy accounted for 91.2% of cases, while laparoscopic cholecystectomy was performed in only 8.8% of cases. These findings align closely with the results of our study, where 90.5% of patients underwent open surgery and only 9.5% had laparoscopic procedures and CBD was explored in 4.3% of cholecystectomy patients. Despite this similarity, the proportion of laparoscopic surgeries in our study is significantly lower compared to global trends and Ayider referral hospital (30% laparoscopic). This discrepancy may be attributed to the limited availability of resources and training opportunities for laparoscopic surgery in developing countries like ours, where such expertise is still being developed.

Single and numerous stones were discovered in 26.7 and 71.4% of cholecystectomy patients, respectively. CBD diameter increased in 6.2% of patients. Distended GB was reported by 67.6% of patients. Adhesion and bile leak/stone spillage occurred in 21.4% and 11.4% of the patients, respectively. These findings differed from an Indian prospective research, which found that 63 and 37% of the stones were single and multiple, respectively. CBD was dilated in more than half of the individuals. Adhesion and bile leak/stone spillage were discovered in 10.3% of individuals.

PCS which is either the persistence of symptoms or the development of new symptoms after gallbladder removal can have diverse etiologies. An incorrect diagnosis such as biliary or extra biliary causes and surgical errors i.e. leaving the stones behind and biliary duct injuries are some of the major classifications for the causes. In our study, the incidence of PCS was found to be 33.3% with a male-to-female ratio of 1:4.4. The most common complaints were right upper quadrant abdominal pain and nausea representing 25.7 and 23.3% respectively. 47.1 % of patients who developed the syndrome were presented with the complaint within 3 months after the surgery. Our study was similar concerning incidence to an Indian cross-sectional study conducted b/n 2008 & 2011 which showed 27%. However, it differs from a Pakistan retrospective, Saudi Arabian prospective, and Indonesian study that reported 16.1%, 19.8% & 45.5% incidence of PCS.

Overall there was no statistically significant relationship exists between PCS and its associated demographics and preoperative symptoms except age and jaundice. The overall incidence has been demonstrated to be higher in females, but likely because more females undergo cholecystectomy surgeries annually. As the patient's age increases and the presence of jaundice might predict which patient might come up with postcholecystectomy symptoms after the surgery. Association with jaundice is supported by an Indian descriptive study.

There was no statistically significant relationship between PCS with intra-operative findings, surgery setting, and operative approaches which contradicts an Indian descriptive study conducted in 2022 that showed these variables have a strong relationship with the development of the syndrome.

An Indian prospective study on the prevalence of PCS b/n open and laparoscopic cholecystectomy in 2023 supports a higher incidence of PCS in laparoscopic procedures than open. This might be due to the higher number of laparoscopic cholecystectomies performed in those studies.

The cause for PCS in our study is unknown in the majority of the participants. Among the identified etiologies gastritis, bile reflux, GB adenocarcinoma, biliary stricture, retained stones, abdominal wall pain, and incisional hernia were mentioned. Despite a large number of patients relieved of the preoperative symptoms and satisfied with the operative procedure quite a significant number of patients were still affected by the impact of symptoms on their emotional well-being, daily activities, and the burden of increased healthcare utilization.

8. Conclusion

Postcholecystectomy syndrome (PCS) is a prevalent condition in Ethiopia, with an incidence rate comparable to global trends. Factors such as advancing age and the presence of jaundice are significantly associated with the development of PCS. It is crucial to inform patients about the potential surgical risks and the possibility of persistent postoperative symptoms. PCS is a notable post-treatment complication that is often underestimated. The use of advanced diagnostic tools, accurate preoperative assessment, careful surgical planning, and precision during the procedure can significantly reduce the occurrence of PCS, ultimately minimizing healthcare costs and improving patient outcomes.

9. Limitations

A key limitation of this study lies in its retrospective nature, which inherently carries the risk of missing critical complications, especially if they were not adequately recorded in the patient's medical charts. This reliance on pre-existing documentation may have led to an incomplete analysis of some important clinical outcomes. Furthermore, the study was constrained by a relatively short postoperative follow-up period, which limited the scope of the findings and prevented the researchers from evaluating the long-term outcomes and potential complications that could emerge over time. These factors highlight the challenges in drawing comprehensive conclusions from the data. Other limitations include the study was confined to a single hospital, potentially limiting generalization.

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11. Appendix

Appendix 1- Informed consent form

Title of the Study:

Analysis of Postcholecystectomy Syndrome after cholecystectomy in ZMH between January 1, 2023, to December 31, 2023.

Principal Investigator:

Dr. Bamlack Shewandagn, MD, PGY IV

Addis Ababa University

Purpose of the Study:

You are invited to participate in a research study investigating the occurrence, contributing factors, and outcomes of postcholecystectomy syndrome. This study aims to enhance our understanding of the condition and identify ways to improve patient care and treatment outcomes.

If you agree to participate, the following will occur:

1. You will be asked to provide information about your medical history, symptoms, and experiences after undergoing cholecystectomy.
2. Data will be collected through interviews and a review of your medical records.
3. Your participation will take approximately 5-10 minutes.

There are minimal risks associated with this study. You may feel some discomfort when discussing personal medical experiences. Although there may be no direct benefit to you, your participation will contribute to improving the understanding and management of post-cholecystectomy syndrome for future patients.

Your responses and medical information will be kept strictly confidential. All data will be coded to remove identifying information, and only authorized researchers will have access to the information.

Participation in this study is completely voluntary. You may decline to participate or withdraw at any time without affecting your current or future medical care.

If you have any questions not answered here about the study or the questionnaire, or have any problems, please do not hesitate to contact: Dr. Bamlack Shewandagn, 0910126158.

Appendix 2- Questionnaire

From medical records

1. Age

2. Sex

3. Which of the following preoperative symptoms did you have?

a) Abdominal pain
b) Heartburn
c) Nausea
d) Vomiting
e) Fatty meal intolerance
f) Bloating
g) Jaundice

4. How long was the duration of the symptoms?

5. Was there a history of cholecystitis?

6. Which comorbidities do you have?

a) Hypertension
b) DM
c) HIV
d) Others (Asthma, CTMNG, Disc prolapse)
e) None

7. Surgery Setting

a) Elective

b) Emergency

8. Operative approach

a) Open cholecystectomy

b) Laparoscopic cholecystectomy

c) Additional CBD exploration

9. Intraoperative findings

a) GB distension (Yes/No)

b) CBD dilatation (Yes/NO)

c) Number of stones (Single, Multiple, None)

d) Adhesion (Yes/ No)

e) Bile leak/ Stone spillage (Yes/No)

From medical records and patient interview

10. Which of the following symptoms did you have postoperatively?

a) Abdominal pain

b) Heartburn

c) Nausea

d) Vomiting

e) Fatty meal intolerance

f) Bloating

g) Jaundice

h) None

11. When did the symptoms start to develop postoperatively?

a) Less than 3 months

b) Within 3-6 months

c) More than 6 months

12. How many times have you visited a healthcare provider postoperatively?

a) 1 or 2 times

b) 3 or more times

13. Have you been prescribed new medications for symptoms or complications post-surgery? (Yes/No)

14. Have you undergone any additional tests related to your surgery? (Yes/No)

15. Do you feel your healthcare needs have been fully addressed since surgery? (Yes/No)

16. Have you experienced stress or frustration due to the symptoms?

a) Not at all

b) Slightly

c) Moderately

d) Significantly

17. Has the symptom-limited your ability to perform daily activities?

a) Not at all

b) Slightly

c) Moderately

d) Significantly

18. Overall satisfaction with the outcome of surgery

a) Very satisfied

b) Satisfied

c) Neutral

d) Dissatisfied