

## ORIGINAL ARTICLE

# To Determine the Prevalence, Diagnosis, and Treatment of Cholelithiasis among the age of 20-60 years

MUHAMMAD ZOHAIB HASSAN<sup>1</sup>, YASIR ARFAT<sup>2</sup>, ZAHID IQBAL<sup>3</sup>, SAAD KHAN<sup>4</sup>, MUHAMMAD IMRAN KHOKHAR<sup>5</sup>, FAISAL SHABBIR<sup>6</sup>

<sup>1</sup>Medical Officer, Gujranwala Teaching Hospital, Gujranwala, Pakistan

<sup>2</sup>Postgraduate Resident (Gastroenterology), Lahore General Hospital, Lahore, Pakistan

<sup>3</sup>House Officer, Mayo Hospital, Lahore, Pakistan

<sup>4</sup>Postgraduate Resident (Surgery), Gujranwala Teaching Hospital, Gujranwala, Pakistan

<sup>5</sup>Associate Professor of Surgery, Gujranwala Teaching Hospital, Gujranwala, Pakistan

<sup>6</sup>Assistant Professor of Surgery, Gujranwala Teaching Hospital, Gujranwala, Pakistan

Correspondence to: Muhammad Zohaib Hassan, Email: drzohaibhassan223@gmail.com

## ABSTRACT

**Background:** Cholelithiasis is a common hepatobiliary disorder with significant clinical and surgical implications. Despite its high prevalence worldwide, data regarding its burden among adults in the economically productive age group remain limited in many developing regions.

**Objective:** To determine the prevalence of cholelithiasis among adults aged 20–60 years and to assess its distribution according to demographic and anthropometric factors.

**Methods:** A hospital-based cross-sectional study was conducted in the Department of Radiology, Gujranwala Teaching Hospital, from August 2021 to February 2022. A total of 2000 adults aged 20–60 years undergoing abdominal ultrasonography were enrolled using consecutive sampling. Demographic data, body mass index, and family history were recorded. Cholelithiasis was defined as the ultrasonographic presence of gallstones. Data were analyzed using SPSS, and results were expressed as frequencies, percentages, and mean  $\pm$  standard deviation.

**Results:** Among the 2000 participants, 53% were females and 47% were males. The overall prevalence of cholelithiasis was 5%. Gallstones were more frequently observed in females compared to males. A higher prevalence was noted in younger adults compared to older participants within the studied age range. Increased body mass index was associated with a higher frequency of gallstone disease.

**Conclusion:** Cholelithiasis was present in a considerable proportion of adults aged 20–60 years, with higher prevalence among females and individuals with increased body mass index. These findings highlight the importance of early identification of at-risk individuals and the role of lifestyle modification in reducing the burden of gallstone disease.

**Keywords:** Cholelithiasis; Gallstone disease; Prevalence; Ultrasonography; Body mass index.

## INTRODUCTION

Cholelithiasis, commonly referred to as gallstone disease, is one of the most prevalent hepatobiliary disorders worldwide and represents a major cause of gastrointestinal morbidity and surgical intervention<sup>1</sup>. It is characterized by the formation of solid calculi within the gallbladder or biliary tract due to disturbances in the composition, metabolism, and flow of bile. These calculi are primarily composed of cholesterol, bilirubin, calcium salts, and mucin glycoproteins, and their formation reflects a complex interaction between metabolic, genetic, and environmental factors<sup>2</sup>.

The gallbladder plays a vital role in the storage and concentration of bile, a digestive fluid synthesized by the liver that facilitates fat digestion and absorption. Under normal physiological conditions, bile remains in a soluble state; however, supersaturation of cholesterol or bilirubin, impaired gallbladder motility, and altered bile acid composition can lead to nucleation and aggregation of crystals, ultimately resulting in gallstone formation<sup>3</sup>. Cholesterol gallstones constitute the majority of cases, particularly in industrialized and developing countries, while pigment stones are more commonly associated with hemolytic disorders and chronic liver disease<sup>4</sup>.

Epidemiological studies have demonstrated that gallstone disease affects approximately 10–15% of the adult population globally, with significant variation across regions, ethnic groups, and socioeconomic settings<sup>2,5</sup>. The prevalence increases with age and is consistently higher among females, particularly during the reproductive years, largely due to hormonal influences such as estrogen-mediated cholesterol hypersecretion into bile<sup>6</sup>. Additional well-established risk factors include obesity, rapid weight loss, sedentary lifestyle, dietary patterns rich in cholesterol and refined carbohydrates, pregnancy, diabetes mellitus, and a positive family history<sup>1,7</sup>.

Although many individuals with cholelithiasis remain asymptomatic, approximately 20–30% develop clinical manifestations over time, including biliary colic, acute or chronic cholecystitis, choledocholithiasis, cholangitis, and gallstone-induced pancreatitis<sup>5,8</sup>. These complications account for a substantial healthcare burden and are a leading indication for elective and emergency abdominal surgery worldwide. Laparoscopic cholecystectomy remains the standard treatment for symptomatic gallstone disease, while asymptomatic cases are generally managed conservatively<sup>9</sup>.

Ultrasonography is widely regarded as the diagnostic modality of choice for gallstone disease due to its high sensitivity and specificity, non-invasive nature, cost-effectiveness, and widespread availability<sup>10</sup>. In resource-limited settings, ultrasound serves as the primary screening and diagnostic tool for evaluating gallbladder pathology, making it particularly valuable for population-based prevalence studies<sup>11</sup>.

Despite the high global burden of cholelithiasis, data regarding its prevalence among adults aged 20–60 years in many developing regions remain limited. Understanding the distribution of gallstone disease within this economically productive age group is essential for early identification of at-risk individuals, targeted preventive strategies, and optimized healthcare planning. Therefore, the present study was designed to determine the prevalence of cholelithiasis among adults aged 20–60 years presenting for abdominal ultrasonography, and to evaluate its distribution across key demographic and anthropometric variables<sup>12</sup>.

## MATERIALS AND METHODS

**Study Design and Setting:** This study was conducted as a hospital-based cross-sectional investigation in the Department of Radiology at Gujranwala Teaching Hospital, Gujranwala, Pakistan. The primary objective of the study was to determine the prevalence of cholelithiasis among adult patients undergoing abdominal ultrasonography during the study period.

**Study Duration and Population:** The study was carried out over a six-month duration from August 2021 to February 2022. The study

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population comprised adult patients aged between 20 and 60 years who presented to the radiology department for abdominal ultrasonographic evaluation for any clinical indication during this period.

**Inclusion and Exclusion Criteria:** Patients aged 20 to 60 years who underwent abdominal ultrasonography and provided informed consent were included in the study. Patients younger than 20 years or older than 60 years, those with a prior history of cholecystectomy, individuals who declined to participate, and those with incomplete demographic or ultrasonographic data were excluded from the study.

**Sample Size and Sampling Technique:** A consecutive sampling technique was employed, whereby all eligible patients presenting during the study period and fulfilling the inclusion criteria were enrolled. A total of 2000 participants were included in the final analysis, providing a sufficient sample size to estimate the prevalence of cholelithiasis with acceptable precision.

**Data Collection Procedure:** After obtaining written informed consent, demographic and clinical data were collected using a structured proforma. Information recorded included age, sex, body weight, height, body mass index, and family history of gallstone disease. All collected data were anonymized to maintain participant confidentiality.

**Anthropometric Assessment:** Body weight was measured using a calibrated mechanical weighing scale, while height was measured using a wall-mounted graduated measuring tape. Body mass index was calculated by dividing weight in kilograms by the square of height in meters. Body mass index values were interpreted according to the World Health Organization classification.

**Ultrasonographic Evaluation:** All participants underwent abdominal ultrasonography following an appropriate fasting period. The gallbladder was examined in multiple planes using a standard ultrasound machine. Sonographic examinations were performed by trained personnel and were supervised and confirmed by a consultant radiologist. Cholelithiasis was defined as the presence of echogenic foci within the gallbladder lumen producing posterior acoustic shadowing and demonstrating mobility with changes in patient position.

**Outcome Measures:** The primary outcome of the study was the prevalence of cholelithiasis, defined as the proportion of participants with ultrasonographically confirmed gallstones. Secondary outcomes included the distribution of cholelithiasis according to age groups, sex, body mass index categories, and family history of gallstone disease.

**Statistical Analysis:** Collected data were entered into a Microsoft database and analyzed using the Statistical Package for Social Sciences (SPSS). Continuous variables were expressed as mean and standard deviation, while categorical variables were presented as frequencies and percentages. The prevalence of cholelithiasis was calculated with 95% confidence intervals. Results were summarized and presented in tabular form.

**Ethical Considerations:** The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Institutional Ethical Review Committee of Gujranwala Teaching Hospital. Written informed consent was obtained from all participants prior to enrollment, and strict confidentiality of patient information was maintained throughout the study.

## RESULTS

Patient demographics are summarized in Table 1. There were 2000 patients in the study. 53% were female. The mean age was between  $60 \pm 18$  years, and the mean, body mass index mean was  $24.0 \pm 5.5$ . It was observed that the prevalence was higher among females than males as it were 6 in females, and 4 in males. Prevalence in the young age group was more than in later age as it was 5% in 20-35 group and in 36-60 group it was 3.

This table 2 presents the age of the participants and their mean. Moreover, BMI is presented for the male, and female, and its

mean. Also, family history about the diseased in males, and females and its mean.

This table 3 presents the data of the gallbladder finding which shows that 95% of people have healthy gallbladder whereas 5% were shows the gallstones in their gallbladder.

Table 1. Demographic Information of the Participants.

Variable	Female	Male	Total.
Age, Mean SD	$60.9 \pm 10.9$	$60.0 \pm 10.9$	$60 \pm 10.9$
>60	550	250	800
>20	690	455	1200
Missing	10	5	15
BMI	Male	Female	Mean
<18.5	12.7	13.1	12.9
18.5-24.9	41.3	54.0	47.1
25.0-29.9	22.0	21.6	21.8
>30.0	18.7	6.9	13.3
Missing	5.3	4.4	4.9
Family History	Yes	No	Mean
Female	1.5	1.2	1.3
Male	1.2	1.5	1.3

Table 2. Findings of the gallbladder for the participants.

Finding	Frequency	Prevalence with CI (95%)
Normal	1900	95%
Gallstones	100	5%

Table 3. Prevalence of cholelithiasis.

Prevalence	Female. (95%CI)	Male. (95% CI)	Total. (95% CI)
Sex	6	4	5
Age			
<20	3	3	3
<40	9	5	7
BMI			
<18.5	6	7	6
18.5-24.9	5	4	5
25.0-29.9	7	2	5
>30.0	9	5	8

## DISCUSSION

Cholelithiasis is one of the most prevalent hepatobiliary disorders worldwide and continues to be a major contributor to gastrointestinal morbidity and surgical workload<sup>1,2</sup>. It represents a significant public health concern due to its high prevalence, potential complications, and associated healthcare costs. Epidemiological data indicate that gallstone disease affects approximately 10–15% of adults globally, with marked variation across regions and populations<sup>2</sup>. The present study evaluated the prevalence of cholelithiasis among adults aged 20–60 years and identified an overall prevalence of 5%, which is consistent with previously reported hospital-based studies from similar settings<sup>3</sup>.

Age is a well-recognized determinant of gallstone formation, with prevalence increasing progressively as individuals grow older<sup>4,5</sup>. Several population-based studies have shown that gallstones are present in 7–11% of individuals below 50 years of age and may reach 30% in those older than 70 years<sup>5,6</sup>. Age-related changes in bile composition, increased cholesterol saturation, and reduced gallbladder motility contribute to this trend<sup>7</sup>. Although gallstone disease is traditionally associated with advancing age, the present study observed a notable burden among younger adults, suggesting early exposure to metabolic and lifestyle-related risk factors<sup>7</sup>.

Sex-related differences in gallstone prevalence are well established, with females consistently exhibiting higher rates than males<sup>8</sup>. This disparity is particularly evident during the reproductive years, where estrogen increases hepatic cholesterol secretion into bile and progesterone reduces gallbladder contractility, thereby promoting stone formation<sup>8</sup>. Previous studies have reported a female-to-male ratio as high as 4:1 in certain populations<sup>9</sup>. The higher prevalence observed among female participants in the current study aligns with these findings and supports the role of hormonal influences in gallstone pathogenesis<sup>10</sup>.

A substantial proportion of individuals with gallstones remain asymptomatic and are often diagnosed incidentally during imaging performed for unrelated indications<sup>10</sup>. Longitudinal studies indicate that only 1–2% of asymptomatic individuals develop symptoms annually, while approximately 20% become symptomatic over a 15-year period<sup>11</sup>. Once symptomatic, patients are at risk of developing serious complications such as acute cholecystitis, choledocholithiasis, cholangitis, and gallstone pancreatitis, all of which significantly increase morbidity and healthcare utilization<sup>12</sup>.

Metabolic factors play a pivotal role in gallstone formation. Obesity has been strongly associated with increased cholesterol synthesis and secretion into bile, resulting in cholesterol supersaturation and crystal nucleation<sup>13</sup>. Additionally, insulin resistance alters bile acid metabolism and gallbladder motility, further predisposing individuals to gallstone disease<sup>14</sup>. The association between higher body mass index and gallstone prevalence observed in this study supports previous findings linking metabolic derangements with cholelithiasis<sup>14,15</sup>.

Pharmacological agents are also recognized contributors to gallstone formation. Octreotide therapy, commonly used in acromegaly and neuroendocrine tumors, has been shown to impair gallbladder contraction by inhibiting cholecystokinin release, leading to bile stasis and stone formation<sup>16</sup>. Studies have reported gallstone development in 13–60% of patients receiving long-term octreotide therapy<sup>16</sup>. Similarly, ceftriaxone, a third-generation cephalosporin, may precipitate in bile and cause biliary pseudolithiasis, particularly in children and patients receiving high doses for prolonged periods<sup>17</sup>.

Although cholelithiasis is less common in children, it is not a rare entity and is increasingly detected due to the widespread use of ultrasonography<sup>18</sup>. Pediatric gallstones are often asymptomatic and may be associated with hemolytic disorders, obesity, infections, and medication use<sup>18</sup>. The risk of gallstone formation increases steadily after the age of 20 years, reflecting cumulative metabolic exposure and age-related alterations in bile synthesis and gallbladder perfusion<sup>19</sup>.

Ultrasonography remains the diagnostic modality of choice for gallstone disease due to its high sensitivity, specificity, non-invasive nature, and cost-effectiveness<sup>20</sup>. Its widespread availability makes it particularly suitable for prevalence studies in resource-limited settings. The findings of the present study, therefore, provide valuable insight into the burden of cholelithiasis within a key adult age group and underscore the importance of early identification, lifestyle modification, and metabolic risk factor control to reduce disease burden<sup>19,20</sup>.

## CONCLUSION

Cholelithiasis is a common hepatobiliary disorder that contributes substantially to gastrointestinal morbidity and healthcare burden. Its development is influenced by alterations in cholesterol metabolism, bile composition, and gallbladder motility. Clinical management depends on symptom status; asymptomatic patients are generally managed conservatively with lifestyle modification, while symptomatic disease requires surgical intervention. Laparoscopic cholecystectomy remains the standard treatment for symptomatic gallstone disease. Early identification of at-risk individuals and patient education regarding dietary habits, weight control, and follow-up care are essential to prevent complications and reduce disease burden.

**Availability of Data and Materials:** The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

**Competing Interests:** The authors declare that they have no competing interests.

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**Authors' Contributions:** Muhammad Zohail Hassan contributed to study conception, data collection, and manuscript drafting. Yasir Arfat and Zahid Iqbal assisted in data acquisition and literature review. Saad Khan contributed to data analysis and interpretation. Muhammad Imran Khokhar and Faisal Shabbir provided critical revision of the manuscript and supervised the study. All authors read and approved the final manuscript.

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