

## Factors Contributing to gallbladder stones in Bangladesh: A Multi-Center Analysis

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### Abstract:

**Background:** Gallstone disease (GSD) is a prevalent disorder worldwide, significantly affecting the healthcare system. The development of gallstones is influenced by various factors, including age, gender, and lifestyle. This study aimed to analyze the personal risk factors contributing to gallstone disease in patients at the Department of Gastroenterology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, and Sylhet Women's Medical College, Sylhet, Bangladesh. **Methods:** A cross-sectional observational study was conducted at BSMMU from January 2023 to December 2023. A total of 169 patients diagnosed with gallstone disease were included. Data were collected from patient records and structured interviews, focusing on demographic characteristics, clinical symptoms, and risk factors such as obesity, sedentary lifestyle, family history, smoking, and alcohol consumption. Ultrasound was used to confirm the presence and characteristics of gallstones. Descriptive statistics were used to analyze the data, and was assessed using SPSS software (version 25.0). **Results:** The study revealed that the majority of patients (30.77%) were in the 51-60 years age group, with a significant female preponderance (65.68%). The most common presenting symptom was right hypochondrial pain (44.38%), followed by nausea (20.71%). The study found strong associations between gallstone disease and personal risk factors, including obesity (BMI > 25 kg/m<sup>2</sup>), sedentary lifestyle, and female gender. The prevalence of gallstone disease was higher among those with these risk factors, consistent with global studies on lifestyle-related contributors to GSD. **Conclusion:** This study highlights the significant role of personal risk factors such as obesity, sedentary lifestyle, and female gender in the development of gallstone disease in Bangladesh. The findings emphasize the need for lifestyle modifications and early detection to reduce the incidence of gallstone disease. Further research, including genetic and molecular studies, is needed to better understand the underlying causes of gallstone disease in the Bangladeshi population.

**Key words:** Gallstone disease, risk factors, obesity, sedentary lifestyle, ultrasound, BSMMU, Bangladesh.

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### I. Introduction:

Gallstone disease is a significant chronic hepatobiliary disorder characterized by the formation of stones (calculi) within the gallbladder, hepatic ducts, or common bile duct. The condition arises primarily from disturbances in cholesterol, bilirubin, and bile acid metabolism, resulting in crystallization and subsequent gallstone formation [1]. The factors contributing to gallstone disease are broadly categorized into immutable (non-modifiable) and modifiable risk factors. Immutable factors include ethnicity, advanced age, female gender, and

pregnancy, whereas modifiable factors include obesity, rapid weight loss, poor dietary habits, diabetes mellitus, hyperlipidemia, multiparity, and certain medications [2,3]. Recent studies emphasize the critical role played by increased body mass index (BMI), abdominal obesity, elevated low-density lipoprotein (LDL), reduced high-density lipoprotein (HDL), and increased triglyceride levels in gallstone pathogenesis [3,4,5].

The global prevalence of gallstone disease has significantly increased in recent decades due to lifestyle changes, notably higher calorie intake, increased consumption of processed and junk foods, and sedentary behaviors leading to decreased physical activity [2,4,6]. Additionally, diets rich in long-chain saturated fatty acids have been strongly associated with elevated gallstone risk [4]. Furthermore, conditions such as liver cirrhosis, hemolytic anemia, ileal diseases, truncal vagotomy, hyperparathyroidism, and biliary tract infections significantly predispose individuals to pigment gallstones [7,8]. Early diagnosis through imaging techniques, particularly ultrasonography, is crucial as it allows timely conservative or surgical intervention, thus preventing severe complications such as acute cholecystitis or cholangitis [1,9,10].

The present study aims to comprehensively evaluate and analyze the factors contributing to gallstone formation among patients attending a tertiary healthcare center in Bangladesh.

## II. Methodology:

**Study Design:** This was a cross-sectional, observational study conducted to analyze the factors contributing to gallstone disease in patients.

**Study Place:** The study was conducted at the Department of Gastroenterology, Bangabandhu Sheikh Mujib Medical University (BSMMU), a tertiary healthcare facility in Dhaka, and Sylhet Women's Medical College, Sylhet, Bangladesh.

**Study Period:** The study was carried out over one year, from January 2023 to December 2023.

**Study Population:** Patients diagnosed with gallstone disease (GSD) who presented to gastroenterology outdoor of BSMMU & SWMCH during the study period were included. The sample size consisted of 169 patients. Inclusion criteria included individuals of both genders, aged 18 years and above, who were clinically diagnosed with gallstones based on ultrasound findings. Exclusion criteria included patients with previous cholecystectomy, patients with incomplete medical records, and individuals with other significant abdominal conditions.

**Data Collection:** Data were collected from patient records and interviews. A structured questionnaire was used to gather information on demographic characteristics, clinical symptoms, risk factors (e.g., obesity, sedentary lifestyle, family history, smoking, alcohol use), and biochemical parameters. In addition, patients underwent ultrasound examination to confirm the presence and characteristics of gallstones.

**Variables:** The primary variables analyzed were age, gender, clinical symptoms, and personal risk factors such as obesity (BMI > 25 kg/m<sup>2</sup>), sedentary lifestyle, smoking, alcohol consumption, and family history of gallstone disease.

**Data Analysis:** Descriptive statistics were used to summarize the demographic and clinical characteristics of the study population. Percentages and frequencies were calculated for categorical variables to see the association between personal risk factor and gall stone disease.

**Ethical Considerations:** The study was conducted in accordance with ethical standards. Written informed consent was obtained from all participants prior to data collection, ensuring confidentiality and voluntary participation.

## III. Result:

**Table 1: Distribution of Cases by Age Group and Gender (n=169)**

Characteristics	No. of cases (n=169)	Percentage (%)
<b>Age group (years)</b>		
≤ 20	5	2.96
21-30	17	10.06
31-40	35	20.71
41-50	45	26.63
51-60	52	30.77
≥ 61	15	8.88
<b>Gender</b>		
Male	58	34.32
Female	111	65.68

Table 1 shows the distribution of cases by age group and gender in a sample of 169 patients. The majority of cases are in the 51-60 years age group, which comprises 30.77% of the total, followed by the 41-50 years age group at 26.63%. The least represented age group is ≤ 20 years, with only 2.96% of the cases. Regarding gender,

females account for a higher proportion, making up 65.68% of the cases, while males represent 34.32%. This indicates that the condition studied predominantly affects older individuals, especially females.

**Table 2: Co-morbidities in the Study Population (n=169)**

Co-morbidities	No. of cases (n=169)	Percentage (%)
Diabetes mellitus	43	25.44
Gastro-esophageal reflux disease	46	27.22
Hypertension	38	22.49
Ischemic heart disease	27	15.98
Renal calculus	15	8.88

Table 2 reveals the prevalence of various co-morbidities in the study population. Gastro-esophageal reflux disease is the most common co-morbidity, affecting 27.22% of the patients, followed closely by diabetes mellitus at 25.44%. Hypertension is also prevalent, with 22.49% of the patients affected. Ischemic heart disease and renal calculus are less common, affecting 15.98% and 8.88% of the patients, respectively. This indicates that the majority of patients suffer from one or more of these co-morbidities, with gastro-esophageal reflux disease and diabetes mellitus being the most frequent.

**Table 3: Clinical Symptoms in the Study Population (n=169)**

Clinical symptoms	No. of cases (n=169)	Percentage (%)
Right hypochondrial pain	75	44.38
Nausea	35	20.71
Epigastric pain	25	14.79
Vomiting	20	11.83
Jaundice	14	8.28

Table 3 highlights the most common clinical symptoms experienced by patients in the study. The most prevalent symptom is right hypochondrial pain, reported by 44.38% of patients. Nausea is the second most common symptom, affecting 20.71% of the patients, followed by epigastric pain at 14.79%. Vomiting and jaundice are less frequently observed, affecting 11.83% and 8.28% of patients, respectively. These findings indicate that right hypochondrial pain is the dominant clinical symptom among the study population.

**Table 4: Findings in Gall Bladder Disease Patients (n=169)**

Findings	No. of patients (n=169)	%
Multiple stones	73	43.20
Two to three stones	33	19.53
Biliary sludge	32	18.93
Single stone	23	13.61
Choledocholithiasis	5	2.96
Carcinoma gall bladder	3	1.78

Table 4 outlines the findings in gall bladder disease patients, with multiple stones being the most common, affecting 43.20% of the patients. The next most frequent findings are two to three stones (19.53%) and biliary sludge (18.93%). Single stone cases account for 13.61%, while choledocholithiasis and carcinoma gall bladder are less common, affecting 2.96% and 1.78% of patients, respectively. This suggests that multiple stones are the predominant finding in gall bladder disease, with other conditions occurring less frequently.

**Table 5: Risk Factors in Gall Bladder Disease Patients**

Risk Factors	Number of patients	%
Sedentary lifestyle	102	60.36
Female gender	111	65.68
Obesity (BMI > 25 kg/m2)	92	54.44
Age > 50 years	62	36.69
Family history	58	34.32
Parity ≥ 3	45	26.63
H/o Rapid weight loss due to Fasting, illness	38	22.49
Alcohol drinking	34	20.12
Smoking	30	17.75
Drugs like ceftriaxone, octreotide and thiazide diuretics.	12	7.10

Table 5 highlights the various risk factors associated with gall bladder disease in the study population. The most common risk factors include a sedentary lifestyle (60.36%), female gender (65.68%), and obesity (54.44%). Age over 50 years is also an important factor, affecting 36.69% of patients. Other notable risk factors include family history (34.32%), parity  $\geq 3$  (26.63%), and rapid weight loss due to fasting or illness (22.49%). Less common risk factors include alcohol consumption (20.12%), smoking (17.75%), and the use of certain drugs like ceftriaxone (7.10%). This suggests that lifestyle factors, gender, and obesity are key contributors to the risk of developing gallbladder disease.

#### **IV. Discussion:**

Gallstones Gallstone disease (GSD) poses a significant health burden, particularly in Bangladesh, where it remains one of the most common disorders among patients presenting to emergency departments with abdominal discomfort. In our study, personal risk factors such as a sedentary lifestyle, obesity, and high waist-to-hip ratio (W/H) were found to be significantly associated with the development of gallstone disease. These findings align with studies showing that obesity increases cholesterol synthesis, biliary cholesterol secretion, and cholesterol supersaturation, which contribute to the formation of gallstones. However, some studies did not find a significant association between these risk factors and GSD [11,12] [8, 9].

In our study, the majority of cases (30.77%) were in the 51-60 years age group, followed by 26.63% in the 41-50 years age group, with female preponderance. A similar distribution was observed in previous studies, such as the one by Veerabhadrapa PS et al., where most cases were found in the 51-60 years age group (26.6%), and 63.3% of the patients were female. This is consistent with the well-established link between female gender and increased risk for gallstone formation. Additionally, the most common presenting symptom in our cohort was right hypochondrial pain (44.38%), followed by nausea (20.71%), which correlates with the findings of Veerabhadrapa PS et al., where 71.7% of patients presented with pain in the hypochondrial region [13] [10]. Our study also found a strong association between certain lifestyle factors and the development of gallstones. These included a sedentary lifestyle, obesity (BMI  $> 25$  kg/m<sup>2</sup>), was consistent with other studies that identified similar risk factors. This is in line with previous studies by Saxena et al. and Dhamnetiya et al., where high BMI and obesity were identified as major risk factors for gallstone formation. Furthermore, factors like rapid weight loss, alcohol consumption, and smoking were also commonly observed in the risk profiles of our patients [14,15] [11, 13].

Interestingly, some studies have reported different prevalence rates for gallstone disease, such as the study by Sayeed Unisa et al., which found a higher prevalence of GBD among females older than 50 years and those with a family history or genetic predisposition. In contrast, our study highlighted the importance of lifestyle factors, including obesity and sedentary behavior, as primary contributors. The risk factors commonly associated with gallstone disease in our study are similar to those observed in other parts of the world. These include increasing age, female gender, obesity, rapid weight loss, and a sedentary lifestyle. The findings from our study also echo the results of Jane C. Figueiredo et al., where BMI over 25 kg/m<sup>2</sup>, diabetes, smoking, and poor dietary habits were significant risk factors for gallstone disease. Moreover, genetic factors and multiparity were identified as additional risk factors in our cohort, aligning with studies like those by Sayeed Unisa et al., who reported a significantly higher risk for females with multiparity [16,17] [12, 16].

Gallstones, especially multiple stones or larger stones, have been linked to an increased risk of gallbladder cancer. The mechanical trauma caused by larger stones can result in metaplasia, dysplasia, and even neoplasia in the gallbladder epithelium, which raises the risk for cancer. These findings are consistent with other research suggesting that multiple and larger stones are associated with a higher risk of malignancy [18,19] [17, 18].

#### **Limitation of the study:**

This study has a few limitations. It was conducted at outdoor patients which may limit the generalizability of the findings. Additionally, the study relied on clinical data from patients seeking care, which could introduce selection bias, as asymptomatic or untreated individuals were not included. The observational nature of the study means it cannot establish causality between risk factors and gallstone disease. Furthermore, self-reported data on lifestyle factors like diet and smoking may lead to recall bias. Despite these limitations, the study provides valuable insights into the risk factors for gallstone disease in Bangladesh.

#### **V. Conclusion:**

This study highlights the vital role of personal risk factors, such as obesity, sedentary lifestyle, and female gender, in the development of gallstone disease in Bangladesh. The findings are consistent with global research, emphasizing the need for lifestyle modifications and early detection to reduce the incidence of gallstone disease. Given the importance of these risk factors, further research, including molecular and genetic studies, is necessary to better understand the underlying causes of gallstone disease in the Bangladeshi population and to develop targeted prevention strategies.

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