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RISK FACTORS ASSOCIATED WITH CHOLELITHIASIS: A CROSS-SECTIONAL STUDY AT QUETTA HOSPITALS

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Abstract

Cholelithiasis, commonly known as gallstone disease, is a major global health concern and one of the most prevalent digestive disorders. The formation of gallstones in the gallbladder is strongly associated with demographic, lifestyle, and dietary factors. This study aimed to identify and analyze the significant risk factors of cholelithiasis among patients attending hospitals in Quetta. A descriptive, cross-sectional study was conducted on 90 diagnosed patients using a structured questionnaire to collect data on demographics, lifestyle habits, and dietary patterns. The sample comprised 12 males and 78 females. Results showed that females (86.7%) and individuals aged 30–55 years (72.2%) were most affected. Most patients were from the Quetta district (58.8%) and belonged to the Pathan ethnic group (63.3%). A large proportion was illiterate (44.4%) and housewives or retired individuals (63.3%). Lifestyle factors such as weight gain (66.6%), high-fat diet (77.7%), and low physical activity were common among patients, indicating a strong link with gallstone formation. The study concluded that age, gender, ethnicity, dietary habits, and physical inactivity are key risk factors for cholelithiasis. Promoting healthy lifestyle and dietary modifications may help reduce the burden of this disease.

Keywords: *Bile acid, Cholelithiasis, Cholesterol, Dietary patterns, Gallstone, Lifestyle, Physical activity*

INTRODUCTION

Cholelithiasis is one of the most common gastrointestinal diseases, characterized by the presence of one or more gallstones in the gallbladder. Globally, it poses a major burden on healthcare systems and is among the most frequently encountered conditions in emergency departments. Gallstones (GS) are hard deposits of digestive fluid that form in the gallbladder or bile ducts (1, 2). Many patients with gallstones remain asymptomatic until complications arise. Common symptoms include abdominal discomfort, epigastric pain, nausea, vomiting, indigestion, and postprandial discomfort. Ethnic background and familial predisposition also play significant roles in gallstone formation (3, 4).

Traditionally, the risk factors for gallstone disease are summarized by the four "F's": forty, female, fertile, and fat (5). Other important contributing factors include gender, age, obesity, physical inactivity, rapid weight loss, high-calorie intake, metabolic syndrome, hepatitis C, and cirrhosis (6). Female gender and increasing age remain among the most significant risk factors for developing gallstones (7, 8).

Gallstones are generally classified into three major types: cholesterol, mixed, and pigment stones. Approximately 90% of all gallstones are composed primarily of cholesterol, while about 2% consist mainly of black and brown pigment stones (9). Excess body weight and adiposity alter bile composition, leading to cholesterol supersaturation, which precipitates cholesterol crystals within the gallbladder and subsequently forms gallstones (10-12). Currently, surgical removal remains the only definitive treatment for gallstones

(13). The present study aimed to analyze the major risk factors associated with cholelithiasis using data obtained from patients diagnosed with the disease.

MATERIALS AND METHODS

Data was collected from patients of gallstone disease from civil hospital and Bolan Medical Hospital (BMC) in Quetta through pre-developed questionnaire. Questionnaire was divided into two parts i.e. demographic data, lifestyle and dietary habits. The data was collected from 90 participants, consisted 12 males and 78 females.

DEMOGRAPHIC DATA

The demographic data comprised of age, gender (male, female), district, ethnicity, and education. Age was categorized into 30-55 age group, 55-70 and above 70 age group. Gallstone incidences in male and female patients from three districts occurred in Quetta hospitals: Quetta, Pishin and Khuzdar. Ethnicity of both genders was categorized in Pathan, Baloch, Punjabi, Hazara and others. To assess the socioeconomic status of the participants, education level and occupation of male and female participants were categorized.

LIFESTYLE AND DIETARY HABITS

Gallstone formation is associated with many risk factors and is influenced by lifestyle and dietary habits (14, 15). Individuals who participated were analyzed for their weight, physical activity and dietary pattern to assess lifestyle habits.

RESULTS

RISK FACTORS ASSOCIATED WITH CHOLELITHIASIS

Data regarding some risk factors such as gender, age, ethnicity, education level, lifestyle and dietary habits was collected and studied. The results are shown below.

GENDER OF PATIENTS WITH CHOLELITHIASIS

The data was collected from 90 participants out of which 12 were males and 78 were females. Most reported cases of cholelithiasis were female patients indicating that female gender is a major risk factor for cholelithiasis.

INCIDENCE OF GALLSTONES IN MALE AND FEMALE PATIENTS IN DIFFERENT AGE GROUPS

The risk of gallstone formation showed a marked increase after the age of 40. Patients were classified into three age categories: 30–55, 55–70, and above 70 years. As presented in Table 1, among the 12 male patients, 9 (75%) were within the 30–55-year group and 3 (25%) were within the 55–70-year group. Among the 78 female patients, 56 (71.7%) were aged 30–55 years, 19 (24.3%) were 55–70 years, and 3 (3.8%) were above 70 years. Overall, the highest frequency of cholelithiasis occurred in the 30–55-year age group (65 patients; 72.2%), followed by the 55–70-year group (22 patients; 24%) and the above 70-year group (3 patients; 3.3%). These findings indicate that middle-aged individuals are at a substantially higher risk of developing cholelithiasis compared to older patients.

Table I. Incidences of gallstones in male and female patients in different age groups

Age	Male		Female		Overall	
(Years)	Number	Percentage	Number	Percentage	Number	Percentage
30-55	9	75%	56	71.7%	65	72.2%
55-70	3	25%	19	24.3%	22	24.4%
Above 70	0	0%	3	3.8%	3	3.3%

INCIDENCES OF GALLSTONES IN MALE AND FEMALE PATIENTS IN QUETTA HOSPITALS

The risk of gallstone formation increased notably after the age of 40 years. Patients were categorized into three age groups: 30–55, 55–70, and above 70 years. As shown in Table 1, among the 12 male patients with cholelithiasis, 9 (75%) were aged 30–55 years and 3 (25%) were 55–70 years old. Among the 78 female patients, 56 (71.7%) were in the 30–55-year group, 19 (24.3%) were in the 55–70-year group, and 3 (3.8%) were aged above 70 years. Overall, the majority of cholelithiasis cases (65; 72.2%) occurred in the 30–55-year age group, followed by 22 (24%) in the 55–70-year group and 3 (3.3%) in the above 70-year group. These results indicate that middle-aged individuals are at a significantly higher risk of developing cholelithiasis compared to older adults.

Table II. Incidences of gallstones in male and female patients in Quetta hospitals

District	Male		Female		Overall	
	Number	Percentage	Number	Percentage	Number	Percentage
Quetta	6	50%	47	60.2%	53	58.8%
Pishin	3	25%	28	35.8%	31	34.4%
Khuzdar	3	25%	3	3.8%	6	6.6%

INCIDENCES OF GALLSTONES IN MALE AND FEMALE PATIENTS IN DIFFERENT ETHNIC GROUPS

The distribution of cholelithiasis cases according to ethnicity in both genders is presented in Table III. Among male patients, 4 (33.3%) were Pathan, 2 (16.6%) Baloch, 3 (25%) Punjabi, 2 (16.6%) Hazara, and 1 (8.3%) belonged to other ethnic groups. Among female patients, 53 (68%) were Pathan, 11 (14.1%) Baloch, 6 (7.6%) Punjabi, 2 (2.5%) Hazara, and 6 (7.6%) were from other ethnicities. Overall, the majority of patients with gallstones were from the Pathan ethnic group (57; 63.3%), followed by Baloch (13; 14.4%), Punjabi (9; 10%), Hazara (4; 4.4%), and others (7; 7.7%). These findings suggest a higher prevalence of cholelithiasis among individuals of Pathan ethnicity compared to other ethnic groups in the study population.

Table III. Incidences of gallstones in male and female patients in different ethnic groups

Ethnicity	Male		Female		Overall	
	Number	Percentage	Number	Percentage	Number	Percentage
Pathan	4	33.3%	53	68%	57	63.3%
Baloch	2	16.6%	11	14.1%	13	14.4%
Punjabi	3	25%	6	7.6%	9	10%
Hazara	2	16.6%	2	2.5%	4	4.4%
Others	1	8.3%	6	7.6%	7	7.7%

EDUCATION LEVEL OF MALE AND FEMALE PATIENTS ON CHOLELITHIASIS

Education level of male and female patients is shown in Table IV. Education level of male were 5(41.6%) illiterate, 3 (25%) were primary level educated, 3 (25%) were matric level educated, 1 (8.3%) were graduates. Whereas education of female patients were 35 (44.8%) were illiterate, 23 (29.4%) were primary level educated, 16 (20.5%) were matric level educated, 4 (5.1%) were graduates. Overall, most of the patients were illiterate 40 (44.4%), 26 (28.8%) were primary level educated, 19 (21.1%) were matric level educated, 5 (5.5%) were graduates.

Table IV. Effect of education level of male and female cholelithiasis patients

Education	Male		Female		Overall	
	Number	Percentage	Number	Percentage	Number	Percentage
Illiterate	5	41.6%	35	44.8%	40	44.4%
Primary	3	25%	23	29.4%	26	28.8%
Matric	3	25%	16	20.5%	19	21.1%
Graduate	1	8.3%	4	5.1%	5	5.5%

OCCUPATIONAL STATUS OF MALE AND FEMALE PATIENTS ON CHOLELITHIASIS

Occupations were grouped in four categories i.e. labor, government job, private job, retired or house wives. The occupations of male and female patients is presented in Table V. Occupation of male were 1(8.3%) labor, 3(25%) were government employees, 7 (58.3%) had private job and 1 (8.3%) was retired. On the other hand, in females 11(14.1%) were labor, 9 (11.5%) were government employees, 2 (2.5%) had private job and 56 (71.7%) were house wives. Overall, 12 (13.3%) participants were labor, 12 (13.3%) were government employees, 9 (10%) had private job and 57 (63.3%) was retired or house wives. It is evident from this table that majority participants were retired and house wives.

Table V. Effect of occupation of male and female patients on cholelithiasis

Occupation	Male		Female		Overall	
	Number	Percentage	Number	Percentage	Number	Percentage
Labor	1	8.3%	11	14.1%	12	13.3%
Govt. job	3	25%	9	11.5%	12	13.3%
Private job	7	58.3%	2	2.5%	9	10%
House wives/retired	1	8.3%	56	71.7%	57	63.3%

LIFESTYLE AND DIETARY HABITS

A comparison of lifestyle and dietary habits in male and female patients is shown in Table VI. The results revealed that the percentage of patients with weight gain was higher in both male and female patients (66.6%) than in normal-weight individuals (33.3%). This indicates that obesity is a significant risk factor for developing gallstone disease. Most patients consumed a high-fat diet, 7 (58.3%) of which were males and 63 (80.7%) of which were females. Physical activity was categorized as light, moderate and active. In males, 7 (58.3%) had light activity, and 5 (41.6%) had moderate physical activity. Whereas in females, 56(71.7%) had light, 22(28.2%) had moderate physical activity, and none had an active lifestyle.

Table VI. Effect of lifestyle and dietary habits in male and female patients

Risk factors	Male	Female
Normal weight	4	10
Weight gain	8	68
Consume high fat diet	7	63
Physical activity		
Light	7	56
Moderate	5	22
Active	0	0

DISCUSSION

In the present study, the risk factors associated with cholelithiasis were analyzed through a questionnaire administered to male and female patients suffering from gallstone disease. The results indicated that female gender was a major risk factor, as the majority of patients were women (78 out of 90). Women were generally at higher risk of developing cholelithiasis than men due to elevated estrogen levels, which increase cholesterol secretion and decrease bile acid production. A similar study has shown that females are more likely to have cholelithiasis than males across all age groups (16). In addition, it has also been found that the frequency of cholelithiasis is higher in the female gender (1).

In concordance with other studies, the present investigation revealed that advanced age is another significant risk factor for gallstone disease (7, 16, 17). Most incidences of male and female patients with cholelithiasis were found in the 30–55-year age group (72.2%). In contrast, a study reported that the highest prevalence of gallstones was observed in women aged 70–79 years (18). Individuals over 40 were approximately ten times more likely to develop gallstones, primarily because the enzymatic activity of cholesterol seven α-hydroxylase, required for bile acid synthesis, decreases with age (19). As the enzyme

activity declines and biliary cholesterol increases, cholesterol saturation occurs, leading to reduced gallbladder motility and bile stasis (20).

The incidence of cholelithiasis was higher among patients from the Quetta district (58.8%) compared to those from the Pishin and Khuzdar districts. This higher prevalence could be attributed to the fact that the study was conducted in hospitals located in Quetta, where healthcare facilities are more advanced, attracting patients from within the city. Moreover, a higher number of patients were of Pathan ethnicity (57%), which may be linked to dietary habits, as this group typically consumes a diet rich in animal fats and oils. The study on the Quetta district is relatively new and has not been previously reported in the literature, making it a valuable contribution to regional epidemiological data.

A high-fat diet, which leads to increased cholesterol levels, is one of the most prominent risk factors for gallstone formation (10). Each additional kilogram of body fat is estimated to produce about 20 mg of excess cholesterol, which contributes to cholesterol supersaturation in bile. Elevated blood cholesterol levels and increased biliary cholesterol secretion are both crucial in the formation of cholesterol gallstones. Excessive caloric intake is also directly associated with increased serum cholesterol levels (21). In this study, most patients reported consuming high-fat diets and had higher body weight. Similar findings have been documented in previous studies showing a positive correlation between high-fat diet consumption and gallstone risk (21). Another study indicated that variations in genes involved in cholesterol metabolism may heighten susceptibility to cholelithiasis by altering the body's response to a high-fat diet (22).

Female patients suffering from gallstones were mostly illiterate and identified as housewives, suggesting their affiliation with lower socioeconomic backgrounds. However, it remains uncertain whether these differences indicate a direct causal relationship with disease risk (23). Nonetheless, the disease imposes a substantial social and economic burden through increased hospital admissions, surgical interventions, and healthcare expenditures.

Patients with cholelithiasis in this study exhibited low to moderate physical activity levels, and none reported engaging in regular exercise. Physical inactivity is known to impair lipid metabolism and bile flow, increasing the likelihood of cholesterol crystallization. Regular physical activity, particularly moderate to vigorous exercises, can reduce the risk of gallstone formation (7, 12, 24). Factors such as age, gender, body mass index, and diet may influence this relationship. Hence, healthcare professionals should encourage active lifestyles to mitigate gallstone risk (18, 24, 25).

In addition to dietary and physical activity factors, obesity and metabolic syndrome are important contributors to gallstone pathogenesis. Increased body mass index (BMI) promotes hepatic secretion of cholesterol into bile, while insulin resistance alters bile composition and gallbladder motility. Therefore, monitoring and managing obesity can serve as an effective preventive measure against cholelithiasis, especially in urban populations with sedentary habits.

Furthermore, genetic predisposition has been recognized as a potential determinant of gallstone formation. Studies suggest that polymorphisms in genes regulating cholesterol metabolism and bile acid transport may increase gallstone susceptibility in certain populations. Investigating such genetic variations in the Balochistan population could provide deeper insight into ethnic or familial patterns of cholelithiasis.

Overall, the findings of this study are consistent with global trends, emphasizing gender, age, diet, physical inactivity, and obesity as key risk factors. However, regional dietary practices, lifestyle factors, and genetic background likely play a unique role in the epidemiology of gallstone disease in Balochistan. Further large-scale, multi-district studies incorporating biochemical and molecular analyses are recommended to better understand these associations and inform preventive strategies.

CONCLUSION

This study revealed that cholelithiasis is primarily associated with female gender, advanced age, obesity, and high-fat dietary patterns. The highest incidence was observed among women aged 30–55 years, reflecting the influence of hormonal and lifestyle factors. Obesity and cholesterol-rich diets were common among both genders, linking excess body weight to gallstone formation. Most cases were reported from the

Quetta district, particularly among the Pathan ethnic group. Lower educational levels and sedentary lifestyles further emphasized the need for community-based health education. Promoting balanced nutrition, weight management, and regular physical activity is essential to reduce the burden of gallstone disease.

Recommendations:

Based on the findings of this study, preventive healthcare strategies should focus on addressing the key risk factors identified. Public health initiatives in Quetta and similar regions must prioritize awareness campaigns on balanced diets and weight management, discouraging high-fat food consumption. Community-based programs encouraging regular physical activity can also help lower obesity-related gallstone risks. As most patients were women aged 30–55, often housewives with limited literacy, culturally appropriate health education programs tailored for women are essential. Lastly, large-scale, multi-district studies are recommended to further investigate genetic predispositions, socioeconomic determinants, and the long-term impact of lifestyle interventions on the prevention and management of cholelithiasis.

Authors' contribution:

IM conducted the research and manuscript writing; NH results analysis; ISS conceptualized the research and results analysis; MT & FN critical analysis; ZUD supervision and statistical analysis; RM, AD & KA experimentation.

Conflict of interest:

All authors declare no conflict of interest.

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