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ASSESSMENT OF THE RISK FACTORS CONTRIBUTING TO INCREASE CHOLELITHIASIS CASES IN PUNJAB: A CROSS SECTIONAL STUDY

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ABSTRACT

Background*: Cholelithiasis is a pathological condition of the digestive system, characterized by the presence of stones originating in the gallbladder. Cholelithiasis is a prevalent medical condition worldwide. Recognizing high-risk populations and creating specialized preventative and intervention plans can be made easier by having a thorough understanding of the risk factors unique to a given area.*

Objective: *To assess the risk factors contributing to increase cholelithiasis cases.*

Method: *Descriptive cross-sectional study conducted in mayo hospital, Lahore. Convenience sampling technique was used to select the study participant. Data were collected from the study participants with help of questionnaire. The participants were recruited and written consent is obtained from each participant. The data is analyzed with the help of frequency and percentage.*

Results: *The majority of participants were over 40 years old (60.9%), with 39.1% falling between 30 and 40 years. Most participants were female (82.8%), married (91.4%), literate (70.3%), and resided in urban areas (71.9%). A significant portion came from a low socioeconomic background, with 50.78% reporting monthly incomes below 30,000. Regarding health factors, 64.8% had no family history of cholelithiasis. Alcohol consumption was reported by 5.5%, while 8.6% were active smokers. Additionally, 42.2% had hypertension, 6.3% had coronary heart disease, and 19.5% had Type-II diabetes mellitus. Biliary atresia was present in 3.1% of participants, while 8.6% had hepatitis. 26.6% had high cholesterol levels, and 57% had a history of malignancy. Soft drink consumption was reported by 49.2%, while 39.8% consumed fast food.*

Conclusion: *Most of the participants were non-alcoholic, non-smokers, and free from chronic diseases, a significant portion had female gender, age above 40, from urban area, history of previous surgery, consumed soft drinks, and followed high-protein diets which was risk factors for cholelithiasis. So implement health education programs targeting the community to raise awareness about the risk factors associated with cholelithiasis*

Keywords: *Risk factors, cholelithiasis cases and Punjab.*

INTRODUCTION

Cholelithiasis, is a pathological condition of the digestive system, characterized by the presence of stones originating in the gallbladder (1). Gallstone disease (GSD) or cholelithiasis affects 10 to 15% of the population of developed countries. Usually GSD, an asymptomatic disease, is diagnosed incidentally through ultrasonography screening. However, it can present as abdominal/back pain, fever, nausea, vomiting, and jaundice(2). Gallstones are associated with potential risk of cholecystitis, pancreatitis, biliary tract obstruction, and gallbladder cancer. Gallstone- associated diseases often require cholecystectomy or percutaneous/endoscopic biliary drainage due to late diagnosis and treatment of severe acute biliary inflammation/infection associated with sepsis and multiple organ failure (3). Gallstones are composed of a mixture of cholesterol, calcium salts of bilirubinate or palmitate, proteins, and mucin. Based upon their predominant constituents, gallstones are broadly classified into cholesterol, brown pigment, and black pigment stones. A variety of risk factors have been reported to be associated with gallstone formation (4). The prevalence of the most frequent type of gallstone remained a controversy in the literature. With a prevalence ranging from 36.8 to 53.0% some authors reported pure cholesterol gallstone as the predominant type; authors reporting a prevalence of pigment gallstone of 37.2% -35% sustained the predominance of this type; elsewhere in the literature, mixed gallstone (66.7% - 89.14%) was reported to be predominate (5).

Cholelithiasis is caused primarily by cholesterol supersaturation (a condition in which cholesterol cannot be soluble) in bile caused by excessive hepatic cholesterol secretion due to genetic factors; Systolic dysfunction of the gallbladder wall; Intestinal dysfunction with excessive absorption of cholesterol or cholesterol super saturation aroused by disturbance in the hepatic circulation of bile (6). The basic mechanism is that the liver secretes cholesterol into the bile, and the excess fraction is carried by lecithin cholesterol vesicles, within which cholesterol is high, has affinity and easily aggregates. These vesicles, when aggregated, eventually become the nuclei initiating the most aggregation of the stones. Granulocytes are triggered after the formation of cholesterol crystals, which expel the DNA out of the cell and encapsulate cholesterol crystals, and then individual crystals aggregate to form larger stones. Therefore, super saturation of cholesterol is a necessary prerequisite for gallstone (7). The estimated overall prevalence of cholelithiasis is 10–15% in the general population, with some differences across countries and the majority of patients being asymptomatic(8). The prevalence of gallstone disease ranged from 5.9- 21.9% in Europe. In the USA, over 20.5 million people 15% of the population(9). According to the research, in industrialized countries, around 10% of adults and 20% of persons over the age of 65 have gallstones in the gallbladder but have no symptoms. This condition affects 20% of people over the age of 40 (10). Multiple studies indicate that up to 72% of patients with symptomatic gallstones have ongoing biliary pain or complications resulting from cholecystitis, an inflammation of the gallbladder (11).

Established risk factors for the development of cholesterol gallstones due to enhanced cholesterol synthesis and secretion include genetic background and lifestyle, as well as internal disorders such as aging, female sex, pregnancy, obesity, rapid weight loss, diabetes mellitus, and dyslipidemia. Predominant risk factors for pigment stones include liver dysfunction, Crohn's disease, and hyperbilirubinemia due to underlying genetic predisposition. Spinal cord injury, prolonged fasting / parenteral nutrition, and gastrectomy have also been reported to be risks for gallstone onset (12).Non-modifiable risk factors such as ethnic background, age, gender, menstrual, and family history (13). Women are more prone to develop gall bladder stones compared to males, this mainly due to the effects of female sex hormones especially progesterone and use of contraceptive pills. The prevalence of gallstone was 13.6%, female gender, people with low level of education, and women who had more than 4 children were more liable to have gallstones (14).

Modifiable risk factors include diet, obesity, rapid weight loss, sedentary lifestyle, and stress. Diet, a modifiable risk factor, specifically high in cholesterol, fatty acids, carbohydrates, or legumes, seems to increase the risk of cholesterol gallstone. Cholesterol gallstone disease is said to be a fellow traveler with metabolic syndrome, which is defined by the presence of abdominal obesity, high blood pressure (BP), high fasting glucose, increased triglyceride levels, and reduced high density lipoprotein (HDL) levels. In addition, dyslipidemia, hyperglycemia, and abdominal obesity are also considered cardiometabolic risk factors and crucial predictors of metabolic syndrome in coronary artery disease (CAD) patients (15).

Gallstones are observed in 8% and 20% of patients over the age of 40 and 60 in Pakistan, respectively. Gallstones are solid, stone-like fragments of bile. About 80% of gallstone carriers are unaware and their gallbladder condition was discovered accidentally through imaging for other signs. Data from Pakistan is still inadequate though, prior study showed that 9.03% of surgery from the Southern Sindh region of Pakistan had a prevalence rate of 4% among men and 14.2 per cent among Pakistani women (16). Clinically, the incidence of gallstone disease has been increasing in the past decade in East Asia, coincident with increasing calorie and fat consumption, decreasing fiber intake, and increasing prevalence of sedentary lifestyle. Despite the large number of previous epidemiological studies analyzing background factors related to gallstones, there have been few large-scale epidemiological studies, especially in East Asian countries (17). Furthermore. The study was advanced medical understanding by increasing the corpus of knowledge about the risk factors for cholelithiasis. In order to increase awareness among medical professionals, students, and the general public, this information can also be used for educational reasons. The purpose of this study was to explore all the risk factors associated with the onset of cholelithiasis in the population of Punjab.

Methodology:

A descriptive cross-sectional study was conducted at Mayo Hospital, Lahore, over four months. Convenience sampling selected 128 patients from the surgical ward, using Cochran's formula for sample size determination. The study included patients over 30 years old with cholelithiasis, both male and female, in pre- and post-operative stages, excluding those in other wards or with psychiatric disorders. Data was collected through a self-structured questionnaire, covering demographics and specific questions about cholelithiasis risk factors. After receiving ethical approval and hospital permission, participants provided consent and completed the questionnaire. The data was then digitized and analyzed using SPSS version 25 and Microsoft Excel. Descriptive statistics and chi-square tests ($p < 0.05$) were used to identify associations between factors and cholelithiasis. Data confidentiality was maintained throughout the process.

Results

Table No: 01 Demographic data from the patients of cholelithiasis

		Frequency	Percent
Age	30-40	50	39.1
	Above 40	78	60.9
	Total	128	100.0
Sex	Male	22	17.2
	Female	106	82.8
	Total	128	100.0
Marital Status	Married	117	91.4
	Unmarried	11	8.6
	Total	128	100.0
Educational Status	Literate	90	70.3
	Illiterate	38	29.7
	Total	128	100.0
Geographical Area	Rural	36	28.1
	Urban	92	71.9
	Total	128	100.0
BMI	Normal	98	76.6
	Abnormal	30	23.4
	Total	128	100.0

Analyzed by frequency and percentage

The study found that 64.8% of participants had no family history of cholelithiasis, while 35.2% did. Most were non-alcoholic (94.5%) and non-smokers (91.4%). Regarding health conditions, 42.2% had hypertension, 6.3%

had coronary disease, 19.5% had Type-II diabetes mellitus, and 3.1% had biliary atresia. Hepatitis was present in 8.6% of participants. Cholesterol levels were normal in 73.4%, and 10.2% had a history of malignancy. While 57% had previous surgeries, 49.2% consumed soft drinks, 39.8% ate fast food, and 63.3% followed a high-protein diet. Most participants were non-alcoholic, non-smokers, and without chronic diseases, but many had surgery histories and specific dietary habits.

Table No: 02 Risk factors of study participants

Risk Factors	Prevalence of Cholelithiasis			
		Frequency	Percent	P-value
Is there a history of cholelithiasis in your family?	No	83	64.8	0.06
	Yes	45	35.2	
Do you consume alcoholic beverages?	No	121	94.5	0.07
	Yes	7	5.5	
Do you smoke?	No	117	91.4	0.067
	Yes	11	8.6	
Do you have high blood pressure?	No	74	57.8	0.073
	Yes	54	42.2	
Do you have a history of coronary heart disease?	No	120	93.8	0.067
	Yes	8	6.3	
Do you have type 2 diabetes?	No	103	80.5	0.073
	Yes	25	19.5	
Do you use insulin if you have diabetes?	No	106	82.8	0.065
	Yes	22	17.2	
Do you suffer from biliary atresia?	No	124	96.9	0.067
	Yes	4	3.1	
Have you been diagnosed with hepatitis?	No	117	91.4	0.073
	Yes	11	8.6	
Do you have a high level of cholesterol?	No	94	73.4	0.04
	Yes	34	26.6	
Do you have any malignancies?	No	115	89.8	0.073
	Yes	13	10.2	
Do you have a history any previous surgery?	No	55	43.0	0.01
	Yes	73	57.0	
Do you consume soft drinks?	No	65	50.8	0.023
	Yes	63	49.2	
Do you like fast food?	No	77	60.2	0.03
	Yes	51	39.8	
Can you eat a high protein diet?	No	47	36.7	0.000
	Yes	81	63.3	

Analyzed by chi square test with p less than 0.05

The study found that 64.8% of participants had no family history of cholelithiasis, while 35.2% did. Most were non-alcoholic (94.5%) and non-smokers (91.4%). Regarding health conditions, 42.2% had hypertension, 6.3% had coronary disease, 19.5% had Type-II diabetes mellitus, and 3.1% had biliary atresia. Hepatitis was present in 8.6% of participants. Cholesterol levels were normal in 73.4%, and 10.2% had a history of malignancy. While 57% had previous surgeries, 49.2% consumed soft drinks, 39.8% ate fast food, and 63.3% followed a high-protein diet. Most participants were non-alcoholic, non-smokers, and without chronic diseases, but many had surgery histories and specific dietary habits.

Discussion:

Most participants were over 40 years old, predominantly female, and married, with the majority being literate and from urban areas. Most had a normal BMI, with fewer having an abnormal BMI. Faisal and colleagues reported an average patient age of 35.01 years, with 38% of females aged 25-35 and 62% aged 36-45. (18).

This study found that the majority of participants came from a low socioeconomic background, with 50.78% having a monthly income below 30,000, while 49.22% had incomes above 30,000. Thus, it is evident that most participants in the study were experiencing low socioeconomic status. From the finding of Ahmed and colleague showed that about 60 % of the study participants have a monthly income greater than 30,000 (19).
The study found that the majority of participants had no family history of cholelithiasis, with only a small percentage consuming alcohol or actively smoking. About 42% had hypertension, 6% had coronary heart disease, and 19.5% had Type-II diabetes mellitus, mostly managed with insulin. A few had biliary atresia, hepatitis, high cholesterol, and a history of malignancy. Additionally, 57% had a history of previous surgeries. Many participants consumed soft drinks and fast food, and a significant portion followed a high-protein diet. Overall, most participants did not have a family history of cholelithiasis and were generally non-alcoholic, non-smokers, and free from chronic diseases, though many had a history of surgery and certain dietary habits. Saldanha and colleagues (2020) found chronic cholecystitis to be the most common histopathological finding in gallstone patients, who also had elevated levels of serum cholesterol, triglycerides, and LDL cholesterol. This underscores the complex relationship between lipid metabolism and gallstone formation, highlighting the disease's multifaceted nature and its implications for treatment (20). Additionally the study of Shirke and Nagtilak the study indicated that gallstones are predominantly present in females aged 21 to 40 years. Elevated triglyceride levels and decreased cholesterol levels are linked to the occurrence of gallstones(21). Nasir and colleagues (2021) reported that 76% of gallbladders had a normal appearance, with 60% of participants having stones. Cholelithiasis was more common in females and married individuals, with patient age, gender, and marital status significantly influencing its prevalence. (22). Furthermore the report of Khalaf and colleague (2016) showed that the prevalence of asymptomatic gallstones was relatively high in this region. Female gender, age, high cholesterol level, family history of gallstones and increased BMI were independent risk factors. Some of these factors such as BMI and the cholesterol level can be prevented by modification of lifestyle to reduce the risk of development of gallstones (23)
The findings of this study shed light on the epidemiological profile of cholelithiasis and its associated risk factors within the studied population. It is evident that while a majority of participants did not have a family history of cholelithiasis and were not affected by chronic diseases such as hypertension, coronary heart disease, type-II diabetes mellitus, biliary atresia, and hepatitis, a significant proportion exhibited risk factors such as previous surgery, soft drink consumption, and adherence to a high protein diet. Aklan and colleagues highlighted the multifactorial nature of gallstone formation, influenced by lipid metabolism, gender, age, marital status, and lifestyle factors like diet and BMI. They found chronic cholecystitis to be the most common histopathological finding, with elevated cholesterol, triglycerides, and LDL cholesterol linked to gallstone diagnosis (24). Furthermore, studies highlighted the prevalence of asymptomatic gallstones, particularly among females, older individuals, and those with a family history of gallstones, underlining the need for preventive measures through lifestyle modifications. Overall, the comprehensive understanding of cholelithiasis gleaned from this study and related research underscores the importance of early detection, risk factor modification, and tailored management strategies to mitigate the burden of gallstone disease on affected individuals and healthcare systems alike (25).

Conclusion:

The study found that most participants were over 40 year's old, female, married, literate, and lived in urban areas. Many had low socioeconomic status, earning below 30,000 monthly. Health-related findings included no family history of cholelithiasis for most, and a minority consuming alcohol and smoking. Some participants had hypertension, coronary heart disease, Type-II diabetes mellitus, biliary atresia, hepatitis, high cholesterol, and a history of malignancy. Additionally, many consumed soft drinks, fast food, and followed high-protein diets. Major risk factors for developing cholelithiasis included being female, over 40, living in urban areas, having had previous surgery, consuming soft drinks, low income, and high-protein diets.

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