

EVALUATION OF TYPES OF GALL STONES AND FACTORS AFFECTING IT.

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Abstract

Introduction: Gallstone (GS) is an important cause of morbidity all over the world. Gallstones are becoming increasingly common and are seen in all age groups. When there is an imbalance in the chemical constituents of bile that result in precipitation of one or more of the components gall stones are formed. In majority of the cases they do not cause symptoms, and about 10% to 20% will eventually become symptomatic within 5 years and 20 years of diagnosis. Gallstones contain mainly cholesterol, bilirubin, and calcium salts, with some amounts of protein and other materials. Pure cholesterol crystals are generally soft, and protein contributes to the strength of cholesterol stones. Pigment stones account for 30 % of gallstones and are divided into black pigment and calcium bilirubinate stones.

Material and Methods: Demographic characteristics of the patients participating in the study such as age, sex, occupation, lifestyle habits such as alcohol consumption, smoking, sports activity, medication if any used, any diseases, Body mass index (BMI), milk consumption, liver diseases and dietary habits was obtained. Patients were divided into two groups depending upon the type of gall stone either cholesterol or pigment stone.

Results: A total of 76 patients were included in the present study who underwent cholecystectomy surgery. Age group of more than 51 years showed maximum number of stones in both the groups. Maximum numbers of stones were seen in patients having family history of stones. Patients who were overweight and obese were having higher incidence of gall stone as compared to normal weight and slim population. Formation of stones in female was more as compared to males.

Conclusion: Various factors can be considered for the formation of gall stones of which gender, increasing age, genetic factors, dilatory habits, and sedentary lifestyle can be considered as the contributing factors for formation of gall stones and most of them can be prevented by proper education.

Keywords: GS, BMI, liver disease, smoking, alcohol consumption.

Introduction

Gallstone (GS) is an important cause of morbidity all over the world. Gallstones are becoming increasingly common and are seen in all age groupsⁱ. It has been reported that the increase in the incidence of gallstone is seen between the ages of 50 and 65 years and is related to longer life expectancies and changes in dietary habitsⁱⁱ. When there is an imbalance in the chemical constituents of bile that result in precipitation of one or more of the components gall stones are formedⁱⁱⁱ. In majority of the cases they do not cause symptoms, and about 10% to 20% will eventually become symptomatic within 5 years and 20 years of diagnosis^{iv}. Gallstone disease is often thought to be a major affliction in modern society.

Gallstones contains mainly cholesterol, bilirubin, and calcium salts, with some amounts of protein and other materials^{vi, vii}. Three types of gallstones has been

described. (i) Pure cholesterol stones, which contain at least 90% cholesterol, (ii) pigment stones either brown or black, which contain at least 90% bilirubin and (iii) mixed composition stones, which contain varying proportions of cholesterol, bilirubin and other substances such as calcium carbonate, calcium phosphate and calcium palmitate^{viii}. Pure cholesterol crystals are generally soft, and protein contributes to the strength of cholesterol stones^{ix}. Various other elements like iron, phosphorus, carbonate, protein, carbohydrates, mucus, and cellular debris can also be found in the gall stones^{x, xi}.

Three types of abnormalities have been described to be responsible for cholesterol gallstone formation. Cholesterol super saturation might occur via excessive cholesterol biosynthesis, which is the main lithogenic mechanism in obese persons. In the non-obese, defective conversion of cholesterol to bile acids, due to a low or relatively low activity of

cholesterol 7 α hydroxylase, could result in excessive cholesterol secretion. Temporary interruption of the enterohepatic bile acid circulation during overnight fasting leads to a higher cholesterol/phospholipid ratio in the vesicles secreted by the liver. Estrogen treatment in females also reduces the synthesis of bile acid^{xii}.

Pigment stones account for 30 % of gallstones and are divided into black pigment and calcium bilirubinate stones^{xiii}. Calcium bilirubinate stones are generally soft, brown, and malodorous^{xiv}.

MATERIAL AND METHODS

Present study was done in the department of Surgery at Prasad Institute of Medical Sciences and hospital; after due approval of the ethical committee. This study included 76 patients who underwent cholecystectomy surgery. Written informed consent was obtained from all the participants. Data was collected from the patients and medical record of the hospital.

Demographic characteristics of the patients participating in the study such as age, sex, occupation, lifestyle habits such as alcohol

consumption, smoking, sports activity, medication if any used, any diseases, Body mass index (BMI), milk consumption, liver diseases and dietary habits was obtained.

Patients were divided into two groups depending upon the type of gall stone either cholesterol or pigment stone according to the reports obtained from the pathology department. Patients were excluded from the study if any malignancy in gall bladder was detected.

Data was analysed using SPSS for Windows 19.0 software. The statistical analysis was done through the percentage evaluation method and chi-square test. A multivariate logistic regression was used for advanced statistical analysis. The results were evaluated at 95 % confidence interval, $p < 0.05$ was considered as statistically significant.

Of the 76 included patients 30 (39.47%) were pigment stones and 46 (60.53%) were cholesterol stones as per pathology report.

RESULTS

A total of 76 patients were included in the present study who underwent cholecystectomy surgery.

Table 1: Types of stones

Gall stone type	n	%
Pigment stones	30	39.47%
Cholesterol stones	46	60.53%
Total	76	100.00%

Demographic characteristics of the patients and types of stones were compared

Table 2: Demographic characteristics and comparison of stones

Demographic data		Pigment stone		Cholesterol stone		p
		n	%	n	%	
Age (years)	≤30	2	6.7%	2	4.3%	$\chi^2 = 0.9698, p = 0.9698$
	31–40	5	16.7%	7	15.2%	
	41–50	11	36.7%	18	39.1%	
	≥51	12	40.0%	19	41.3%	
Gender	Female	16	53.3%	26	56.5%	$\chi^2 = 0.0747, p = 0.7846$
	Male	14	46.7%	20	43.5%	
Family history	None	10	33.3%	12	26.1%	$\chi^2 = 0.5974, p = 0.9633$
	Mother	2	6.7%	3	6.5%	
	Father	3	10.0%	6	13.0%	
	Sibling	9	30.0%	14	30.4%	
	Relative	6	20.0%	11	23.9%	
BMI	Slim	1	3.3%	2	4.3%	$\chi^2 = 0.635, p = .88837$
	Normal	4	13.3%	7	15.2%	
	Overweight	12	40.0%	17	37.0%	
	Obese	13	43.3%	14	30.4%	

No statistically significance was observed between two types of stones. Age group of more than 51 years showed maximum number of stones in both the groups. Maximum number of stones was seen in patients having family history of stones. Patients who were overweight and obese were having higher incidence of gall stone as compared to normal weight and slim population. Formation of stones in female was more as compared to males.

Discussion and Conclusion

Cholesterol super saturation, there is an essential requirement for cholesterol gallstone formation, which occur via excessive cholesterol biosynthesis^{xv}. Pigment stones are formed when red blood cells are being destroyed, leading to excessive bilirubin in the bile. Black pigment stones are more common in patients with cirrhosis or chronic haemolytic conditions such as the thalassemia, hereditary spherocytosis, and sickle cell disease, in which bilirubin excretion is increased^{xvi}.

In our study 76 patients were included who underwent cholecystectomy surgery of which 30 (39.47%) were pigment stones and 46 (60.53%) were cholesterol stones as per pathology report. Most of the patients in both the groups were in age range of >51 years. Similar results were shown in other study, also in community-based studies performed in countries where gallstone disease is common, the disease has been reported at a higher rate in females than in males which was in accordance to our study^{xvii}.

In our study cholesterol stones were more prevalent as compared to pigment stones. Similar preponderance of female was reported in a study by Pradhan S Bet al^{xviii}.

In our study about both gallstone types were seen more in those with a family history of gallstone. Studies done on families have concluded that genetics play a significant role on the formation of gallstone, and the results of those studies can be considered consistent with those of the current study^{xix}.

Incidence of gall stones was more in overweight and obese patients in both groups of our study. Physical activity is an indicator of body weight and a high rate of cholesterol stone incidence was found in this study for patients who did not undertake any physical activity^{xx}. Scragg et al. also observed that the risk of

gallstone formation in obese women under the age of 50 was higher than in the general population^{xxi}.

To conclude many factors can be considered for the formation of gall stones of which gender, increasing age, genetic factors, dilatory habits, and sedentary lifestyle can be considered as the contributing factors for formation of gall stones. Out of these factors most of the factors except genetic factors can be treatable and gall stones can be prevented by proper education

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