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A Study on the Risk Factors of Gallstone Formation in Patients Admitted in a Hospital

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Abstract

Introduction: There is little agreement about the effect of dietary components on the risk of gallstones. Fasting is normally associated with increased biliary cholesterol saturation and this phenomenon persists or even becomes more accentuated in obesity. A large clinical study showed that being even moderately overweight increases the risk for developing gallstones. Obesity also reduces gallbladder emptying *Methodology*: Fifty patients diagnosed with Cholelithiasis were included in the study after applying inclusion, exclusion criteria were examined, investigated and operated during the study period. An unrestricted materials and methods are gathered. Detailed history of all Patients was collected according to the proforma. *Results*: Higher incidence of gallstones is common in patients with BMI of 18.5-24.9 Kg/m^2 constituting 82% of 50 patients, other BMI group forming small subset. Mean age being 29 years. *Conclusion*: High BMI and Low middle SES was statistically associated with gall stones.

Keywords: Gall Stones; Risk Factors; BMI.

Introduction

At least 10 percent of adults have gallstones. The prevalence varies with age, sex, and ethnic group. There is an increasing prevalence with age, after the age of 60 about 10 to 15 percent of men and 20 to 40 percent of women have gallstones. In a recent ultrasound survey in Denmark, a large population was reexamined at five-year intervals. In each five-year period, new gallstones formed in about 3 percent of the population over the age of 40. 25% of children with gallstoneshave hemolytic disease. Other possible predisposing factors are cystic fibrosis, liver disease, bowel resection and heart disease. The overall prevalence of gallstone disease in industrialized countries appears to be between 10% to 20% [1].

Ultrasound surveys shows a female: male ratio of about 2:1 in the younger age groups.The risk of gallstones is also associated with a history of childbearing, estrogen-replacement therapy, and oral-contraceptive use, but not diabetes mellitus [2].

It is higher in markedly obese persons and in those who lose weight rapidly. There is little agreement about the effect of dietary components on the risk of gallstones. Fasting is normally associated with an increased biliary cholesterol saturation and this phenomenon persists or even becomes more accentuated in obesity. A large clinical study showed that being even moderately overweight increases the risk for developing gallstones. Obesity also reduces gallbladder emptying [3].

A high serum cholesterol level does not seem to be a risk factor for development of gall stones, most biliary stones are made of cholesterol; Lipoprotein lipids are precursors of biliary lipids; synthesis, uptake, and degradation of plasma lipoproteins occur in the Liver; Cholesterol and bile acids in bile are only means of eliminating cholesterol from body. Yet, even in largest clinical series, no definite association between serum lipids and gallstones have been found, except for a high frequency of gallstones in subjects with hyperlipedemias (type IV hyperlipoproteinaemia). On the other hand, hypertriglyceredemia may be

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positively associated with an increased incidence of gall stones. Most studies found no relationship between plasma cholesterol and gall stones, but suggested that gallstone risk varies inversely with plasma total HDL 0r HDL 3 cholesterol, attributing to HDL cholesterol, a protective effect against gallstone formation ,where as no association has been reported in some studies [4,5].

Decreased physical activity positively associated with the presence of gallstones in some studies, but no clear physiologic mechanism has been shown to explain this association. In addition no association between alcohol, or caffeine ingestion and development of gallstones has been found.

Gallstones are a potential complication of rapid weight loss, whether the weight loss is induced surgically or by diet. Approximately 10% to 38% of patients who have undergone surgery for morbid obesity subsequently develop gallstones. Gallstones develop in approximately 25% of patients who lose weight rapidly by severely restricting caloric intake.

A large prevalence study of gallstones from Denmark showed that in men and women, a history of one or more episodes of dieting (weight loss of at least 5kg) was associated with a significantly higher prevalence of gallstones.The development of gallstones was examined during 8 week period in 51 obese patients on a diet of 2100 kJ / day (0.8% fat) and in 26 control subjects. After 8 weeks, gallstones were found in 13 and sludge in 3 subjects on the diet compared with none in the controlled subjects. Three of the patients with stones developed biliary pain and underwent surgery; cholesterol stones were found in each one of them. Gallstones disappeared in 4 patients on follow-up for six months.Several aspects of gallstone formation were studied prospectively in a largegroup of patients undergoing gastric bypass surgery (Roux-en-Y bypass) for morbid obesity. Intraoperative Ultrasonography demonstrated gallstones in 20 of 105 patients and sludge in 4, leaving 81 patients with normal gallbladder available for follow-up. In the 6 months after surgery, 31 of 81 patients (38%) developed gallstones and another 10 (12%) sludge. This was the period of most rapid weight loss, with 74% of the total weight loss occurring during this time. At 12 and 18 months after operation these percentages remained constant. several factors may be associated with rapid weight loss in these patients that accentuate the pre-existing tendency of obese patients to form stones. Among these could be decreased gallbladder motility caused by decreased cholecystokinin levels or other mechanisms, acceleration of cholesterol crystal growth, and increased biliary cholesterol secretion [6].

Pregnancy has been shown to be a risk factor for gallstoneformation in several studies. A correlation has been noted between the number ofpregnancies and the risk for gallstones, and the relative risk may be higher in womenwho became pregnant at younger age. Parity was associated with the pregnancy in the Simirone study, and therelative risk increased with the number of pregnancies particularly in younger women. Multivariate analysis of potential risk factors in the GREPCO study showed that parity was a significant independent risk factor for stones, especially in younger (aged 25 to 30 years) women who have had 2 or more pregnancies.

No increased risk was demonstrated in the Simironestudy and GREPCO studies from Italy, where as a higher risk was shown in the studyfrom Denmark. The risk of development may be directly related to the estrogencontent of the contraceptive which has decreased over time. An increased risk may bepronounced in younger women than in older ones [7,8].

Methodology

Study Design

Prospective cohort study.

Study Population

All adult patients diagnosed as Cholelithiasis admitted in hospital during the study period.

Method

Fifty patients diagnosed with Cholelithiasis were included in the study after applying inclusion, exclusion criteria were examined, investigated and operated during the study period. An unrestricted materials and methods are gathered. Detailed history of all Patients was collected according to the proforma. History including age, sex, socioeconomic status [Modified Kuppuswamy classification], Life style [Modified Gopalan. C., B. V Ramasastri and S.C Balsubramanian(1991) (National Institute of Nutrition), Indian Council of Medical Research, Hyderabad, India]. Diet history was taken as per five food groups suggested by Indian Council of Medical Research, Hyderabad, India. Nature of symptoms, past history of similar complaints was obtained. All patients were examined thoroughly. All Patients had

haemogram, Liver Function Test, blood sugars, blood urea, serum Creatinine, urine analysis, chest x ray Electrocardiography for patients age more than 40 years, and Ultasonography of abdomen. Relevant investigations and speciality consultations were taken for patients with associated medical illness and their control was achieved.

Risk and complications of condition as well as surgery have been explained to patient, consent was taken. Preoperative antibiotics were given. In this study some patients had undergone open Cholecystectomy and some patients had laparoscopic Cholecystectomy. Gallbladder was sent for histopathological examination. All patients were properly examined in post operative period to note the development of complications. Suitable treatment was given according to need.

Results

Higher incidence of gallstones are common in patients with BMI of 18.5-24.9 Kg/m^2 constituting 82% of 50 patients, other BMI group forming small subset. Mean age being 29 years.

Majority of patients were consuming mixed diet.

Patients with average consumption of cereal, pulses, meat, sugars, vegetables constitute major group.

Patients with moderate type of life style forming 76% of total population, with sedentary being 24%. No patients were found in heavy worker life style.

Lower middle class constitute major group with 80% of patients, with 20% in upper middle class.

Inference Higher BMI is statistically associated with Cholesterol stone with P=0.121 (3x4 Fisher Exact test).

Inference Lower middle class is more associated with Mixed stone and Pigment stone with P=0.132 (3x 5 Fisher Exact test).

Inference Incidence of type of stone is not statistically associated with life style with P=0.749 (3x3 Fisher exact test).

Table 1: BMI distribution of patients studied

BMI (kg/m^2)	Number of Patients	%
18-25.0	42	94.0
25.1-30.0	7	14.0
>30.0	1	2.0
Total	50	100.0

Table 2: Diet

Diet	Number of Patients (n=50)	%
Veg/Mixed		
Vegetarian	10	20.0
Mixed	40	80.0
Cereals		
High	0	0.0
Average	50	100.0
Low	0	0.0
Pulse		
High	0	0.0
Average	50	100.0
Low	0	0.0
Meat		
High	1	2.0
Average	28	56.0
Low	11	22.0
Not taking	10	20.0
Sugar		
Adequate	35	70.0
Low	15	30.0
Vegetables		
Adequate	47	94.0
Low	3	6.0

Table 3: Life style

Life Style	Number of Patients	%
Sedentary	12	24.0
Moderate	38	76.0
Heavy	-	-
Total	50	100.0

Table 4: Socio-economic Status

SES	Number of Patients	%
Upper [I]	-	-
Upper middle[II]	10	20.0
Lower middle III]	40	80.0
Upper lower [IV]	-	-
Lower [V]	-	-
Total	50	100.0

Table 5: Distribution of stone according to BMI(kg/m^2)

BMI (kg/m^2)	Total number of patients		Cholesterol stone		Mixed stone		Pigment stone	
	No	%	No	%	No	%	No	%
<18.5	1	2.0	-	-	1	100.0	-	-
18.5-24.9	41	82.0	2	4.9	38	92.7	1	2.4
25.0-29.9	7	14.0	-	-	6	85.7	1	14.3
30.0 & above	1	2	1	100.0	-	-	-	-
Total	50	100	3	6.0	45	90.0	2	4.0
Inference	Higher BMI is statistically associated with Cholesterol stone with P=0.121 (3x4 Fisher Exact test)							

Table 6: Distribution of stone according to Socio-economic status

SES	Total number of patients		Cholesterol stone		Mixed stone		Pigment stone	
	No	%	No	%	No	%	No	%
Upper [I]	-	-	-	-	-	-	-	-
Upper middle[II]	10	20.0	2	20.0	8	80.0	-	-
Lower middle III]	40	80.0	1	2.5	37	92.5	2	5.0
Upper lower [IV]	-	-	-	-	-	-	-	-
Lower [V]	-	-	-	-	-	-	-	-
Total	50	100	3	6.0	45	90.0	2	4.0
Inference	Lower middle class is more associated with Mixed stone and Pigment stone with P=0.132 (3x 5 Fisher Exact test)							

Table 7: Distribution of stone according to Life style

Life style	Total number of patients		Cholesterol stone		Mixed stone		Pigment stone	
	No	%	No	%	No	%	No	%
Sedentary	12	24.0	-	-	12	100	-	-
Moderate	38	76.0	3	7.9	33	86.8	2	5.2
Heavy	-	-	-	-	-	-	-	-
Total	50	100.0	3	6.0	45	90.0	2	4.0
Inference	Incidence of type of stone is not statistically associated with life style with P=0.749 (3x3 Fisher exact test)							

Discussion

All 50 patients of gallstone disease subjected to this study were categorized according to their BMI. Most of these patients had average BMI. So the studies of Jayanthi.V [9] which Showed majority of patients who suffered from gallstones disease were of average BMI. Similarly, studies of Prevalence of biliary disease in India by Khuroo MS et al [10] andPrevalence of gallstones disease in Pima Indians by Sampliner R E et al[11]embarked on majority of patients suffering from gallstone disease belonged to average BMI group.

Our study showed 84% of patients had normal BMI mean 22.98±2.38 . There was statistical association between cholesterol stones and higher BMI. Trotman et al [12] observed that BMI in patients with cholesterol gallstones and pigment stones were similar .

Majority of the patients with gallstone disease in this study belonged to moderate work group (76%) One of the study conducted in the past showed a relationship between gallstone disease and low

physical activity in rural Caucasian women by William CN et al [13]. The study of Thornton JR et al [14] demonstrated association between low plasma high density lipoprotein cholesterol and high lithogenic index of bile Thornton JR et alwith occurrence of gallstone disease Scragg RKR et al [15]. Therefore, low physical activity was associated with high incidence of gallstone disease.

Socio economic status of an individual was assessed on the basis of Modified Kuppuswamy's classification, most widely used method in India, is based on three variables- occupation, education and monthly income.

Studies conducted by Khuroo MS et al [10] and Friedman GDet alshowed a higher incidence of gallstone disease in high socio economic group, explaining the link between gallstone formation with more consumption of fat in diet and less physical activity. Whereas Murry FE et al [16] showed increase risk of gall stone disease in lower social group. The present study conducted grouped the middle class into higher and lower groups in which gallstone disease is seen more common in lower middle class group.

This study showed higher incidence in lower middle class (80%), which is in contrary to study conducted in Khuroo MS et al and Friedman GDet al .Contrary it was found higher incidence in high socioeconomic group Swapan Chandra Dhar et al. Possible explanation may lie in greater fat consumption in this group, person in this group have less physical activity. However in Murry FE et al [16], there was a significant trend towards increased risk of gallstone disease in lower social group.

Conclusion

1. Higher Body Mass Index patients has statistically co-relation with Cholesterol stone.
2. Lower middle class group is more statistically associated with Mixed type of gall stone and Pigment gall stones.

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