



A STUDY TO ESTABLISH CORRELATION BETWEEN BIOCHEMICAL TYPE OF EXTRA HEPATIC BILIARY CALCULI WITH CLINICAL PARAMETERS

KEYWORDS

Gallstone, cholesterol stone, Mixed stone, Pigment stone

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ABSTRACT

Gallstones are among the most common gastrointestinal illness requiring hospitalisation and frequently occur in young, otherwise healthy people. Chemical analysis of gall stones is essential to determine aetiopathogenesis of gallstone disease. The purpose of this study is to evaluate the incidence of the type of extra hepatic biliary calculi in Southern part of Odisha and correlation of its incidence with clinical parameters.

INTRODUCTION

Gallstones are among the most common gastrointestinal illness requiring hospitalisation and frequently occur in young, otherwise healthy people with a prevalence of 11% to 36% in autopsy reports.[1] Extra hepatic biliary calculi includes gallbladder stones and common bile duct stones.

Cholesterol stones have been noted as early as in Egyptian mummies and the disease thus might have existed for more than 35 centuries.[2]

Women are three times more likely to develop gallstones than men and first degree relatives of patients with gallstones have a twofold greater prevalence.[3]

There has been a remarkable shift in the trend of gallstone disease from the middle aged, fertile, fat, females to young asthenic females in their twenties.[4]

There is a predominance of cholesterol gallstones among the north Indians and that is reflected both in gallbladder as well as CBD stones analysis, including the CBD stones not accompanied by a demonstrable stone in the gallbladder. In contrast, South Indians have a predominance of pigment gallstones both in the gall bladder and CBD.[5]

Chemical analysis of gall stones is essential to determine aetiopathogenesis of gallstone disease. For chemical analysis the stones are subjected to 2 steps. Stage of extraction and stage of chemical analysis.[6]

The purpose of this study is to evaluate the incidence of the type of extra hepatic biliary calculi in Southern part of Odisha and correlation of its incidence with clinical parameters and several comorbid conditions of the patient, so as to minimize morbidity and mortality and provide the patient with the best chance of satisfactory outcome.

AIM OF THE STUDY

To correlate the type of stone with the clinical parameters (age, sex, built, diet, lifestyle) of the patient and to evaluate at the end antecedent risk factors in the causation of gallstone disease amenable to primary prevention.

MATERIALS

The above study was conducted on patients attending surgical Out Patient Department, Emergency Department as well as patients admitted to surgical wards of MKCG Medical College and Hospital , Berhampur from the period of August 2014 to July 2016 . Out of all cases a total of 173 cases were recorded for comparison and

conclusive study.

Inclusion criteria

- All patients diagnosed to have cholelithiasis and choledocholithiasis.

Exclusion criteria

- All patients with acalculous cholecystitis.
- Patients those who refused admission.

METHODS

The patients admitted to surgical wards were subjected to

- Questionnaires and clinical examination
- As per occupation of the patient, lifestyle (physical activity) of the patient was categorized
 - Sedentary (Desk job, no exercise) - Teacher, Doctor, Engineer
 - Moderate activity (Moderate exercise 3-5 days/week) - Maid Servants, Carpenter, Electrician etc
 - Heavy activity (Heavy exercise, Everyday) - Farmer, Sports man, stone cutter

After recording Weight (in Kg) and Height (in meters) the BMI of the patient was calculated so as to categorise the patient accordingly as per built.

$BMI = \text{Wt}(\text{in Kg}) / (\text{Height in meters})^2$, (As per WHO 2004)

- Underweight <18.5
- Normal weight 18.5-24.99
- Overweight 25-29.99
- Obese >30
- Stones obtained following Surgery were subjected to biochemical analysis
 - Stage of Extraction-The stones were powdered in a pestle and mortar and dissolved in different solvents. To determine total cholesterol and total bilirubin, 30mg stone powder was dissolved in 3 ml chloroform in a test tube. The tube was kept in boiling water bath for 2 min. The stone solution thus obtained was used for determination of total cholesterol and total bilirubin. To determine calcium 30 mg stone powder was dissolved in 3 ml INHCL in graduated 10 ml tube and its final volume was made up to 10 ml with distilled water. The tube was kept in boiling water bath for 1hr.[6]
 - Chemical analysis – Reading through colorimetry

Bilirubin - Erba-LIQUXX BILIRUBIN (BIT & BID)
Diazo Method, End Point

Cholesterol - Erba-CHOLESTEROL DES KIT
Dynamic Extended Stability
CHOD-PAP METHOD (With LCF), END POINT

Calcium - SIEMENS-AUTOPAK CAL KIT
Cresolphthalein complexone method

Quantitative analysis of metabolites and cations and anions in different types of biliary calculi expressed as mg/gm dry stone powder (Data are mean±SE) (P.Chandran et al in 2007)[6] -

1. Cholesterol stone - 597.98±33.22(Total cholesterol), 2.10±0.32 (Total bilirubin), 10.66±1.85(calcium).

2. Mixed stone - 594.78±24.91(Total cholesterol), 1.72±0.19(Total bilirubin), 26.52±2.39(calcium).

3. Pigment stone - 489.85±28.68(Total cholesterol), 4.87±0.49(Total bilirubin), 27.60±3.13(calcium).

- At the end a correlation was looked for between type of stone and age, sex, built, lifestyle, comorbid illness.

The data was entered in MS EXCEL 2010 and analysed using application statistics. χ^2 test and student t test were used to calculate and p value with <0.05 was considered to be statistically significant.

RESULTS

- Out of 173 patients, 109 were female and 64 male. The age group varied from a minimum of 19yrs to 78 yrs. Maximum incidence was seen in between 41-50 yrs with 55 patients followed by 31-40yrs with 41 patients.

- Out of 173 , 127 (73.4%) consumed mixed nonvegetarian diet. 83(47.9%) were found to be sedentary workers, 46 (26.6%) moderate and 44 (25.4%) heavy workers.

- 6(3.4%) were found to be underweight , 54(31.2%) were normal weight, 77 (44.6%) overweight and 36 (20.8%) were obese.

- 30.1% patients were found to be suffering from diabetes mellitus, 39.8% from hypertension and 33.5% from dyslipidemia.

Table 1.
BIOCHEMICAL TYPE OF STONE

Biochemical type	GB calculi	CBD calculi	Total	Percentage, n=173
Cholesterol	38	3	41	23.6
Mixed	88	13	101	58.3
Pigment	24	7	31	17.9

ANALYSIS AND DISCUSSION

Table 2.
CORRELATION OF AGE WITH TYPE OF STONE

	Cholesterol	Mixed	Pigment
Age mean	49.293+/-13.29	44.47 +/-12.38	40.19+/-9.31

P value - 0.007

With a p value of 0.007 the result is statistically significant which means pigment stones were more found to be in younger age group in comparison to mixed and cholesterol stones.

Table 3.
CORRELATION OF SEX WITH TYPE OF STONE

Sex	Cholesterol	Mixed	Pigment
Female	65.9%	58.4%	67.7%
Male	34.1%	41.6%	32.3%
Total no. of stone	41	101	31

χ^2 value - 1.23

P value - 0.53

It is seen that incidence of all types of stones in females is more in comparison to male. However with χ^2 value 1.23 and p value 0.53, the data is found to be statistically insignificant.

Table 4.
CORRELATION OF BODY BUILT WITH TYPE OF STONE

Built	Cholesterol	Mixed	Pigment
Underweight	2.4%	3%	6.5%
Normal weight	12.2%	35.6%	41.9%
Overweight	31.7%	51.5%	38.7%
Obese	53.7%	9.9%	12.9%
Total no. of stone	41	101	31

χ^2 value - 38.33

P value <0.01

Out of all stones, cholesterol stone is maximum seen in obese category (53.7%) and least in underweight (2.4%). Mixed stone is maximum seen in overweight category (51.5%) and least in underweight individuals (3%). Pigment stone is maximum seen in normal weight individuals (41.9%) and least in underweight individuals (6.5%). With χ^2 value of 38.33 and p value <0.01, the result is found to be statistically significant.

Table 5.
CORRELATION OF DIET WITH TYPE OF STONE

Diet	Cholesterol	Mixed	Pigment
Non vegetarian	90.2%	59.4%	96.8%
Vegetarian	9.8%	40.6%	3.2%
Total no. of stone	41	101	31

χ^2 value - 24.769

P value - <0.01

All types of stones, that is cholesterol, mixed and pigment stone are found to be more in patients consuming nonvegetarian diet than those consuming vegetarian diet. The χ^2 value is 24.769 and p value is 0.001. Hence the result is statistically significant.

Table 6.
CORRELATION OF PHYSICAL ACTIVITY WITH TYPE OF STONE

Physical activity	Cholesterol	Mixed	Pigment
Sedentary	73.2%	44.6%	25.8%
Moderate	17.1%	22.8%	48.4%
Heavy	9.8%	32.75	25.8%
Total no. of stone	41	101	31

χ^2 value - 22.36

P value - <0.01

The maximum number of cholesterol stones (73.2%) is seen in sedentary individuals and least in heavy workers(9.8%). Maximum number of mixed stones is seen in sedentary workers(44.6%) and least in moderate workers (22.8%) and maximum number of pigment stone is seen in moderate worker (48.4%) and least of 25.8% is seen in both sedentary and heavy workers (25.8%). The χ^2 value is 22.36 and p value is <0.01. Hence the result is statistically significant.

Table 7.
CORRELATION OF DIABETES MELITUS WITH TYPE OF STONE

DM	Cholesterol	Mixed	Pigment
Yes	82.9%	17.8%	3.2%
No	17.1%	82.2%	96.8%
Total no. of stone	41	101	31

χ^2 value - 71.52

p value <0.01

Out of all patients with cholesterol stones 82.9% are found to be having Diabetes mellitus. In mixed stone 17.8% cases and pigment stone 3.2% cases are having DM. With χ^2 value of 71.52 and p value <0.01, the result is statistically significant.

Table 8.

CORRELATION OF HYPERTENSION WITH TYPE OF STONE

Hypertension	Cholesterol	Mixed	Pigment
Yes	92.7%	29.7%	3.2%
No	7.3%	70.3%	96.8%
Total no. of stone	41	101	31

χ^2 value – 69.4

P value - < 0.01

Out of all cases with cholesterol stones, 92.7% cases are having hypertension, in mixed stone 29.7% cases and in pigment stone 3.2% cases are having hypertension. With χ^2 value of 69.4 and p value < 0.01 the result is statistically **significant**.

Table 9.

CORRELATION OF DYSLIPIDEMIA WITH TYPE OF STONE

Dyslipidemia	Cholesterol	Mixed	Pigment
Yes	82.9%	22.8%	0
No	17.1%	77.2%	100%
Total no. of stone	41	101	31

χ^2 value – 66.34

P value - < 0.01

Out of all cases with cholesterol stones 82.9% and amongst mixed stone 22.8 % are having dyslipidemia and none among those having pigment stone. With χ^2 value of 66.34 and p value of < 0.001 the data is statistically **significant**.

CONCLUSION

- In southern part of odisha mixed stone is found to be in maximum incidence followed by pigment and cholesterol.
- A significant correlation of cholesterol stone to a comparatively older age group was seen in comparison to age predilection of mixed and pigment stones.
- No specific correlation exists between type of stone and sex.
- A significant correlation exists between cholesterol stones and obesity, sedentary workers, consuming mixed non vegetarian diet, and those suffering from comorbid illness like DM, HTN, Dyslipidemia.
- The above risk factors being modifiable factors are amenable to primary prevention.

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