



COMPARATIVE STUDY OF SERUM, CHOLESTEROL, BILIRUBIN, CALCIUM AND PHOSPHOROUS IN GALLSTONE DISEASES

General Surgery

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ABSTRACT

Millions of individuals worldwide suffer from gallstones, one of the most prevalent gallbladder issues. According to studies, 10–22% of gallstones in females worldwide affect Indian women. An issue that is specific to India is the high prevalence of gallstones combined with the increased incidence of gallbladder cancer. This study's aim is to evaluate the factors such as serum cholesterol, bilirubin, calcium, and phosphorous-in relative to sex and age in gallstone illnesses. Over a 12-month period, this study was carried out in the Department of Surgery at Nehru Hospital, B.R.D. Medical College, Gorakhpur. 100 patients suffering from GSD and proven by USG and undergoing cholecystectomy were recruited. Mean serum cholesterol, bilirubin, calcium, phosphorous values were statistically significantly higher in patients with mixed type vs. cholesterol type of stone, pigmented type vs. cholesterol type of stone and with pigmented type vs. mixed type ($p < 0.05$). Gallbladder stones are more prevalent in female subjects with increasing age. Risk of cholelithiasis is increased by a sedentary lifestyle and light physical activity. The most prevalent form of gallstone comprises mixed gallstones.

KEYWORDS

Gallbladder, Gallstones, Serum cholesterol, Serum Bilirubin, Serum Calcium, Serum Phosphorous

INTRODUCTION

The most widespread gastrointestinal condition is commonly gallstone disease, affects 10% to 15% of adults in affluent nations. The majority of people who have this illness don't have any symptoms.⁽¹⁾ The main components of gallstones are solid fragments that develop in the gallbladder, include calcium carbonate, calcium phosphate, bilirubin, cholesterol, and trace minerals.⁽²⁾ One of the mostly documented rates of gallbladder cancer worldwide is seen in northern India. Delhi's female GBC incidence rate is 21.5/100,000, the highest in the world.⁽³⁾ The most frequent risk of gallbladder cancer is gallstones, which seem to happen earlier in life in India.⁽⁴⁾ Complex biomineralized deposits called gallstones that develop in the gallbladder continue to be a major global health concern.⁽⁵⁾ GS are classified into three types based on their primary chemical makeup: pigmented, mixed, and cholesterol. As the primary component of cholesterol GS, pigmented gallstones have higher levels of bilirubin and bilirubinate, whereas combinations of the other two are known as mixed GS.⁽⁶⁾ A crystalline concretion called a gallstone is created inside the gallbladder by the buildup of bile components.⁽⁷⁾ Gallstones are associated with a number of risk factors, with feminine gender, age, diabetes, rapid weight loss, metabolic syndrome, and gallbladder stasis. The only treatment for gallstone disease at this time is surgical gallbladder ectomy.⁽²⁾

Gallstone patients' altered serum parameter levels were also investigated in order to see whether they could serve as a viable diagnostic tool for the early diagnosis of GS formation. In 1896, Naunyn created the first classification of gallstones. According to Peter et al.'s 2020 categorization, gallstones can be classed as pure, mixed, composite cholesterol, carbonate stones, and stones with black and brown pigments.^(8,9)

The aim of this investigation was to ascertain whether the type of gallstone is determined by the serum levels of various factors and to examine the distribution of variables among individuals with gallstones. Researchers can attempt to address that characteristic while developing a more modern, targeted gallstone treatment method if there are any noteworthy findings.

MATERIAL AND METHOD

Study Setting

This cross sectional observational study was performed in the Department of General Surgery during a 12-month period at Nehru Hospital, B.R.D. Medical College, Gorakhpur.

Study Population

Study was performed on 100 patients admitted during study period

suffering from GSD and proven by USG and undergoing cholecystectomy.

Inclusion Criteria

- Patients whose abdominal ultrasonography confirmed the presence of gallstones.
- Individuals who have had cholecystectomy for the same reason.
- Patients who were prepared to take part in the research.

Exclusion Criteria

- The condition known as acalculous.
- Individuals suffering from obstructive jaundice.
- Individuals who declined cholecystectomy.
- Patients who are unfit for cholecystectomy.
- Individuals who were unable to provide written informed permission for the study.

Study Procedure

The study's methodology involved taking detailed clinical histories and performing thorough clinical examinations and routine blood investigations, including serum cholesterol, bilirubin, calcium, and phosphorus levels. An elaborate study was conducted on patient details, history, examination findings, investigations, type of surgery, and stone types and numbers. History included presenting complaints, duration, past history, family history of gallstone disease, haemolytic disorder history, and OCP use. Clinical examinations were followed by abdominal ultrasounds to confirm cholelithiasis and note associated cholecystitis. Patients without cholelithiasis on ultrasound were excluded. Quantitative analyses of serum parameters were done using specific methods, and all patients underwent preoperative investigations followed by either open or laparoscopic cholecystectomy. Post-cholecystectomy, stones were classified into cholesterol, pigment, and mixed types based on their morphology. Data was collected and analysed statistically. The means and standard deviations of the measures made by each group were used for statistical analysis (SPSS 25.00 for Windows; SPSS inc, Chicago, USA). The significance level was established at $p < 0.05$, and the t-test was used to evaluate the difference between the two groups.

RESULTS

This cross sectional study was performed during a 12-month period at the Department of General Surgery at Nehru Hospital, B.R.D. Medical College, Gorakhpur among 100 patients suffering from GSD and proven by USG and undergoing cholecystectomy. The goal of the study was to compare serum cholesterol, bilirubin, calcium and phosphorous in gallstone disease. A majority of the patients involved

in study were women (n=86, 86%) and 14 were males. Mean age of the study subjects was 46.77 ± 12.03 years. In present study, after cholecystectomy and retrieval of stones, they were separated into three categories according to the type of gallstones, such as cholesterol stones, pigment stones, mixed stones. Maximum retrieved stones were of mixed type i.e., 43 (43%), followed by 31 (31%) pigmented type stone and least were cholesterol type stone (n=26, 26%).

Table 1: Descriptive analysis of serum cholesterol, bilirubin, calcium and phosphorous

Variables	Mean	SD	Median
Serum Cholesterol	173.05	35.19	168
Bilirubin	0.96	0.32	0.85
Calcium	9.34	1.67	8.9
Phosphorous	3.92	1.15	3.8

As depicted in table 1, mean level of serum cholesterol was 173.05 ± 35.19 and median value was 168. The mean level of bilirubin was 0.96 ± 0.32 and median value was 0.85. The mean level of calcium was 9.34 ± 1.67 and median value was 8.9. The mean level of Phosphorous was 3.92 ± 1.15 and median value was 3.8.

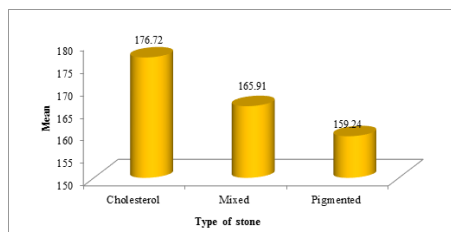


Figure 1: Comparison of serum cholesterol according to type of stone

As depicted in figure 1, mean level of serum cholesterol when the stone was cholesterol type was 176.72 ± 32.81 , in mixed type stone was 165.91 ± 37.23 and in pigmented type stone was 159.24 ± 36.09 . Serum mean cholesterol values were statistically significant higher in patients with cholesterol type of stone when compared with pigmented type stone, with p value of 0.032. Although difference in mean cholesterol level was present in cholesterol vs. mixed and mixed vs. pigmented, but it was not significant.

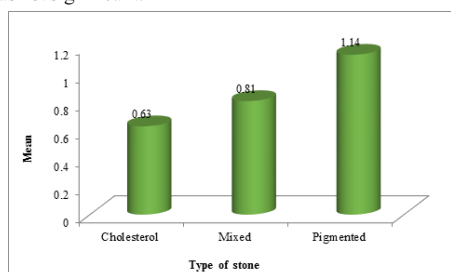


Figure 2: Comparison of bilirubin according to type of stone

As depicted in figure 2, mean level of bilirubin when the stone was cholesterol type was 0.63 ± 0.30 , in mixed type stone was 0.81 ± 0.25 and in pigmented type stone was 1.14 ± 0.37 . Serum mean bilirubin values were substantially greater in patients with mixed types as compared to cholesterol type of stone, pigmented type when compared with cholesterol type of stone and with pigmented type vs. mixed type (p-value=0.045, 0.003, 0.008, respectively).

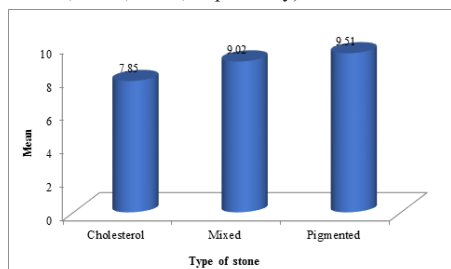


Figure 3: Comparison of calcium according to type of stone

As depicted in figure 3, mean level of calcium when the stone was cholesterol type was 7.85 ± 1.66 , in mixed type stone was 9.02 ± 1.48

and in pigmented type stone was 9.51 ± 1.79 . Serum mean calcium values were substantially greater in patients with mixed types, as contrasted with cholesterol type of stone, pigmented type when compared with cholesterol type of stone (p-value=0.023, 0.009, respectively). Although difference in mean calcium level was present in mixed vs pigmented, but it was significant.

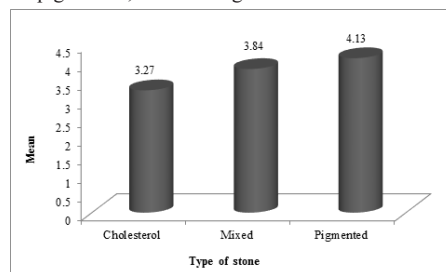


Figure 4: Comparison of phosphorous according to type of stone

As depicted in figure 4, mean level of phosphorous when the stone was cholesterol type was 3.27 ± 1.18 , in mixed type stone was 3.84 ± 1.12 and in pigmented type stone was 4.13 ± 1.33 . Serum mean phosphorous values were statistically significant higher in patients with pigmented type of stone when compared with cholesterol type stone, with p value of 0.037. Although difference in mean phosphorous level was present in cholesterol vs. mixed and mixed vs. pigmented, but it was not significant.

Table 2: Comparison of serum cholesterol, bilirubin, calcium and phosphorous according to gender

Variables	Male		Female		p value
	Mean	SD	Mean	SD	
Serum Cholesterol	176.86	38.03	172.43	37.38	0.68
Bilirubin	0.81	0.27	0.98	0.35	0.69
Calcium	9.21	0.78	9.37	0.72	0.43
Phosphorous	3.34	0.81	3.94	0.89	0.021

The mean serum cholesterol level in males was 176.86 ± 38.03 and in females was 172.43 ± 37.38 , showing no significant difference between two with p value 0.68. The mean serum bilirubin level in males was 0.81 ± 0.27 and in females was 0.98 ± 0.35 , showing no significant difference between two with p value 0.69. The mean serum calcium level in males was 9.21 ± 0.78 and in females was 9.37 ± 0.72 , showing no significant difference between two with p value 0.43. The mean serum phosphorous level in males was 3.34 ± 0.81 and in females was 3.94 ± 0.89 , showing significant difference between two with p value 0.021 (Table 2).

DISCUSSION

Gallstone disease, a chronic recurrent hepatobiliary disorder caused by inadequate metabolism of cholesterol, bilirubin, and bile acids, is categorized by the development of gallstones in the hepatic bile duct, common bile duct, or gallbladder.⁽⁹⁾ In current study, there was majority of female subjects i.e., 86% subjects were females and 14 % were males. The male to female ratio was 1:6.14. In present study, mean age of the study subjects was 46.77 ± 12.03 years, ranging between 21-72 years of age. This finding was parallel with results Nath et al. who found that the age group 41–50 years old had the most instances (n = 14), followed by the age group 51–59 years old (n = 12); the age group 21–30 years old had the fewest cases (n = 5), as in present study.⁽¹⁰⁾ In present study, maximum retrieved stones were of mixed type i.e., 43 (43%), followed by 31 (31%) pigmented type stone and least were cholesterol type stone (n=26, 26%). This finding was parallel with results of Kalghatgi et al. discovered that, of the 39 stones gathered, 15 had mixed calculi, 14 had pigment calculi, and 10 had cholesterol calculi.⁽¹¹⁾ These findings suggest that gallstones gathered by Kalghatgi et al., during study are mixed (38.5%), pigment (35.8%), and cholesterol (25.6%), in accordance with the present study.⁽¹¹⁾ In present study, mean level of serum cholesterol was 173.05 ± 35.19 and median value was 168. The mean serum cholesterol level in males was 176.86 ± 38.03 and in females was 172.43 ± 37.38 , showing no significant difference between two with p value 0.68. Bharathy et al. also found that cholelithiasis patients have higher levels of serum cholesterol, as in present study.⁽¹²⁾ The mean level of bilirubin was 0.96 ± 0.32 and median value was 0.85. The mean level of phosphorous was 3.92 ± 1.15 and median value was 3.8. However, according to the current study, this difference was not statistically significant on the

unpaired t test (p value >0.05).

CONCLUSION

The present study concluded that gallbladder stones are more prevalent in female subjects with increasing age. Risk of cholelithiasis is increased by a sedentary lifestyle and light physical activity. The most prevalent form of gallstone comprises mixed gallstones. Serum cholesterol, bilirubin, calcium and phosphorous levels didn't show significant difference in prevalence of gall bladder of subject. More research needed on sociodemographic variables and biochemical components of cholelithiasis from a public health standpoint.

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