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A CROSS-SECTIONAL STUDY ON THE PREVALENCE OF DYSLIPIDEMIA IN PATIENTS WITH CHOLELITHIASIS ADMITTED TO A SURGICAL DEPARTMENT

General Surgery

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ABSTRACT

Introduction: Dyslipidemia is implicated in gallstone pathogenesis, but its prevalence and association with gallstone types remain debated. This study evaluated the prevalence of dyslipidemia in cholelithiasis patients and its correlation with gallstone type, sex, and hypertension. **Materials and Method:** hospital-based cross-sectional study (2023-2025) included 100 ultrasonography-confirmed cholelithiasis patients. Demographic, clinical, and lipid profile data were collected. Gallstones were classified histopathologically post-cholecystectomy. Statistical analysis used chi-square tests, t-tests, and ANOVA (SPSS v25). **RESULTS:** Dyslipidemia prevalence was 79.27% in females and 83.33% in males. All cholesterol stone patients (100%) exhibited dyslipidemia versus 81.25% with mixed stones and 77.55% with pigment stones. Significant associations existed between dyslipidemia and elevated triglycerides (p=0.01), LDL (p=0.03), and VLDL (p<0.001), but not with total cholesterol (p=0.89), sex (p=0.95), hypertension (p=0.49), or gallstone type (p=0.61). Conclusion: Dyslipidemia is highly prevalent in cholelithiasis patients, with triglycerides, LDL, and VLDL as key contributors. Routine lipid profiling in gallstone patients is recommended for cardiovascular risk mitigation.

KEYWORDS

Dyslipidemia, Cholelithiasis, Diabetes mellitus and Lipid

INTRODUCTION

Dyslipidemia, a condition marked by abnormal lipid levels in the bloodstream, is widely recognized as a major risk factor for the development of cardiovascular diseases and various metabolic disorders.[1] Numerous studies have highlighted the potential link between dyslipidemia and gallstone formation, with elevated cholesterol levels being implicated as a predisposing factor. The pathophysiological mechanism underlying this association involves the precipitation of cholesterol crystals in bile, a process that can be influenced by alterations in lipid metabolism.[2,3,4] A substantial proportion of individuals with gallstones remain asymptomatic, as the condition often manifests without noticeable symptoms. This asymptomatic nature presents challenges in early diagnosis and management, as gallstones may remain undetected until complications arise.[3] The formation of gallstones is a multifactorial process influenced by several factors. Key contributors include bile supersaturation, gallbladder bile concentration, the rapid nucleation of cholesterol crystals, mucin accumulation, and impaired gallbladder motility.[4,5] Gallstone disease (GSD) is one of the most prevalent biliary disorders worldwide. In European countries, its prevalence is estimated to range between 10% and 20%, while in Asian populations, it ranges between 5% and 8%.[6] In India, there is significant regional variation, with a higher prevalence observed in the northern parts of the country compared to the southern regions.[7] Cholesterol gallstones consist of 51%–99% pure cholesterol, while mixed gallstones contain cholesterol, calcium salts, bile acids, phospholipids, and bile pigments.[8] Excess cholesterol or reduced phospholipid or bile acid levels result in multilamellar vesicle formation, which eventually leads to cholesterol crystal nucleation and gallstone formation.[9]

This study is aimed at determining the prevalence of dyslipidemia in patients diagnosed with cholelithiasis who are admitted to the surgery department. While the role of dyslipidemia in gallstone disease has been explored in multiple studies, inconsistencies in findings have arisen due to variations in study designs, sample sizes, participant ethnicity, and definitions of dyslipidemia. These inconsistencies have limited the generalizability of results, underscoring the need for further research to clarify the relationship between lipid abnormalities and gallstone formation.

Patients and Methods in Clinical Studies

A cross-sectional analytical study was conducted at K.D. Medical College, Mathura (2023-2025). Institutional Ethics Committee approval (Ref: KDMCHRC/IEC/2023/08) and written informed consent were obtained. The study was conducted over a period of two years. Participants above 18 years and had ultrasonography-confirmed cholelithiasis were included in the study and participants with Diabetes mellitus, coronary heart disease, HIV, gallbladder carcinoma, prior biliary surgery, liver cirrhosis, or chronic pancreatitis diseases were excluded from the study.

Sample size calculated by Using the formula $n = Z^2pq/d^2$ (Z=1.96, prevalence p=0.09, error d=0.05), a minimum sample size of 100 was calculated.

Data Collection and Analysis

Each patient underwent a detailed clinical evaluation, including demographic assessment, medical history, and lifestyle factors. Preoperative investigations, including hematological, biochemical, and imaging studies, were conducted.

Sample Collection and Biochemical Analysis

- Venous blood samples (2-3 ml) were collected in plain vials after overnight fasting.
- Blood samples were sent for biochemical analysis.
- **Laboratory Tests:** Fasting venous blood analyzed for lipid profile (TC, TG, HDL, LDL, VLDL) via autoanalyzer.
- **Gallstone Analysis:** Stones classified histopathologically post-cholecystectomy as cholesterol, pigment, or mixed

Surgical Procedure

After obtaining anesthetic fitness, patients underwent: Open cholecystectomy or Laparoscopic cholecystectomy. The surgically removed gallbladders were sent for histopathological and biochemical examination in the Department of Pathology/Biochemistry.

Statistical Analysis

The comparison of the variables which were quantitative in nature was analysed using Independent t test. The comparison of the variables which were qualitative in nature was analysed using Chi-Square test. $p \leq 0.05$ was considered significant and Use of SPSS vs 2025 to analyzed the data.

RESULT

A total of 100 patients diagnosed with cholelithiasis based on ultrasonography findings were included in the study.

Dyslipidemia Prevalence was 80% and dyslipidemia was in 79.27% females and males 83.33% males. Results were found to be insignificant when comparing dyslipidemia with sex (p=0.95) (Table 1)

Table 1 :Dyslipidemia By Sex (%)

Sex	Absent	present	pvalue
F	20.73	79.27	0.95
M	16.67	83.33	

Test used- chi square, p>0.05 insignificant.

The data reveals that all individuals with cholesterol stones (100%) had dyslipidemia, indicating a strong correlation between cholesterol stones and abnormal lipid levels. In contrast, dyslipidemia was present in 77.55% of those with pigment stones and 81.25% of those with mixed stones. Results were found to be insignificant when comparing dyslipidemia with gall stone type (p = 0.61) (Table 2)

Table 2: Dyslipidemia by Gallstone Type (%)

Gallstone_Type	False	Present	Chi value	pvalue
Cholesterol stones	-	100.0	0.98	0.61
Pigment stones	22.45	77.55		
mixed stones	18.75	81.25		

Test used- chi square, p>0.05 insignificant.

By using independent t test, results indicate that triglycerides (p = 0.01), HDL (p = 0.01), LDL (p = 0.03), and VLDL (p = <0.001) are significantly associated with dyslipidemia. A negative t-value for HDL suggests that lower HDL levels are linked to dyslipidemia, while higher triglycerides, LDL, and VLDL levels contribute to its presence. However, cholesterol levels (p = 0.89) do not show a significant difference between dyslipidemic and non-dyslipidemic groups, indicating that total cholesterol alone may not be a reliable marker for dyslipidemia in this population. (Table 3).

Table 3- Lipid Levels & Dyslipidemia

Lipid Parameter	T-statistic	P-value
Cholesterol	0.14	0.89
Triglycerides	5.99	0.01*
HDL	-10.41	0.01*
LDL	2.27	0.03*
VLDL	5.94	<0.001*

Test used- independent t test, p>0.05 insignificant and p≤0.05 significant.

By using Anova test, results indicate that cholesterol (p = 0.01), triglycerides (p = 0.01), LDL (p = 0.01), and VLDL (p = 0.01) show significant differences among different gallstone types. However, HDL levels (p = 0.61) do not significantly vary across gallstone types (Table 4).

Table 4 : Gallstone Type & Lipid Levels

Lipid Parameter	F-statistic	P-value
Cholesterol	18.36	0.01*
Triglycerides	5.11	0.01*
HDL	0.5	0.61
LDL	17.28	0.01*
VLDL	5.04	0.01*

Test used- Anova, p>0.05 insignificant and p<0.05 significant

DISCUSSION

Our study found that 79.27% of females and 83.33% of males had dyslipidemia, indicating a slightly higher prevalence among males. However,(p = 0.95) showed no statistically significant association between dyslipidemia and sex. In contrast, Henry Völzke et al. (2005)[10] found that women had a higher risk of gallstone disease compared to men, with a strong link between dyslipidemia and gallstones.

In our study, pigment stones were the most common (49%), followed by mixed stones (48%), while cholesterol stones were the least prevalent (3%). The study by Dr. Navyashree N et al. (2020)[11] found that mixed stones were the most common (64.04%), followed by pigment and cholesterol stones. Weerakoon et al. (2014)[12] reported that 51% of patients had cholesterol stones, while 49% had pigment stones.

Our study showed a significant association between triglycerides (p = 0.01), HDL (p = 0.01), LDL (p = 0.03), and VLDL (p = 0.00) with dyslipidemia, whereas total cholesterol (p = 0.89) did not show a significant difference. This indicates that triglycerides, LDL, and VLDL contribute more to dyslipidemia than total cholesterol alone. The study by Jose V. Francisco Menezes et al. (2019)[13] found that cholecystectomy led to significant reductions in total cholesterol, LDL, VLDL, and triglycerides (p < 0.001), while increasing HDL levels (p < 0.001). This suggests that gallstone formation is linked to lipid imbalances, and cholecystectomy may improve lipid metabolism. Similarly, Neha Jindal et al. (2013)[14] found that post-cholecystectomy patients showed significant reductions in TC, LDL, TG, and increases in HDL, reinforcing our finding that LDL and triglycerides are key drivers of gallstone-related dyslipidemia.

Conclusion

Dyslipidemia was prevalent in 79.27% of females and 83.33% of males. Notably, all individuals with cholesterol stones exhibited dyslipidemia (100%), while it was also prevalent in those with pigment stones (77.55%) and mixed stones (81.25%). Statistical analysis indicated no significant association between dyslipidemia and sex (χ^2 = 0.02, p = 0.95), hypertension (χ^2 = 0.48, p = 0.49), and gallstone type (χ^2 = 0.98, p = 0.61). Furthermore, despite the high prevalence of dyslipidemia in gallstone patients, no statistically significant association was found between dyslipidemia and gallstone formation. This suggests that while lipid abnormalities, particularly elevated triglycerides, LDL, VLDL, and low HDL, are common in gallstone patients, they may not be directly responsible for gallstone formation.

These findings imply that dyslipidemia may coexist with gallstone disease rather than being a primary etiological factor.

Limitations of the Study

Limitations: Single-center design, small sample size, and lack of control group limit generalizability. Confounding factors (genetics, gut microbiota) were unassessed.

Future research with a larger, multi-center cohort, a prospective design, and inclusion of additional metabolic parameters is warranted to better understand the relationship between dyslipidemia and gallstone disease.

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