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ORIGINAL RESEARCH

Association between hyperlipidemia and cardiovascular disease risk: A hospital-based observational study

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ABSTRACT

Background: Hyperlipidemia is a enormous public health problem and a primary modifiable risk factor for cardiovascular sickness (CVD). in spite of advancements in lipid-lowering therapies, hyperlipidemia remains notably everyday, contributing drastically to the worldwide burden of CVD. This have a look at aimed to analyze the association between hyperlipidemia and CVD hazard amongst person sufferers at a tertiary care medical institution. **Methods:** A hospital-based observational study was conducted over 12 months. A total of 300 adult participants (age ≥ 18 years) were included. Demographic data, lipid profiles, and cardiovascular assessments were collected through chart review and interviews. Hyperlipidemia was defined according to standard clinical cutoffs for total cholesterol, LDL-C, HDL-C, and triglycerides. The primary outcome measure was the presence of CVD, assessed by documented history of coronary artery disease, myocardial infarction, angina, or stroke. Statistical analyses included chi-square tests, t-tests, and logistic regression modeling to identify predictors of CVD. **Results:** Of the total participants, 150 were classified with hyperlipidemia and 150 with normal lipid levels. Patients with hyperlipidemia demonstrated significantly higher rates of hypertension, diabetes mellitus, and obesity compared to those with normal lipid levels ($p < 0.05$). Logistic regression revealed that elevated LDL-C and low HDL-C were independently associated with increased CVD risk after adjusting for age, gender, and other comorbid conditions. Participants with severe hyperlipidemia (LDL-C ≥ 160 mg/dL) exhibited more than a threefold risk of CVD compared to those with optimal lipid profiles. **Conclusion:** The evidence indicates a robust relationship between hyperlipidemia—specifically higher LDL-C and lower HDL-C—and risk of cardiovascular disease. Early detection, focused lipid modification, and lifestyle modification are critical to alleviate the CVD burden. Additional studies are needed to investigate the effect of new therapies and to develop more accurate risk stratification metrics.

Keywords: Hyperlipidemia, Cardiovascular Disease, LDL-C, HDL-C, Risk Factors

INTRODUCTION

Cardiovascular disease (CVD) is one of the leading causes of morbidity and mortality worldwide, and its burden continues to grow in both developed and developing nations (1). Early explorations of lipid metabolism highlighted the critical role of hyperlipidemia in the pathogenesis of atherosclerosis and its complications (2). Subsequent research reinforced that dysregulated lipid profiles—specifically elevated low-density lipoprotein cholesterol (LDL-C) and reduced high-density lipoprotein cholesterol (HDL-C)—significantly increase the risk of CVD events, including myocardial infarction and stroke (3). Despite public health initiatives promoting balanced diets, regular exercise, and pharmacological interventions, hyperlipidemia remains highly prevalent across diverse populations (4).

Atherosclerosis is the primary pathological process linking hyperlipidemia and CVD. Lipid accumulation within the arterial wall triggers a cascade of inflammatory responses, ultimately leading to the formation of atherosclerotic plaques (5). These plaques can compromise arterial integrity, impair blood flow, and predispose individuals to acute coronary syndromes. Notably, epidemiological data suggest that the risk of CVD escalates exponentially with increasing LDL-C levels, thereby underscoring LDL-C as a central therapeutic target (6). Meanwhile, HDL-C is considered “protective,” owing to its role in

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reverse cholesterol transport. Low HDL-C levels have been associated with an amplified cardiovascular risk profile, especially in the presence of additional metabolic abnormalities such as insulin resistance, obesity, and hypertension (7).

By the late 1990s, guidelines emerged recommending more aggressive lipid-lowering interventions for individuals at heightened risk, including those with a history of type 2 diabetes mellitus, existing CVD, or multiple cardiovascular risk factors (8). Nonetheless, the impact of these guidelines in routine clinical practice has been variable, often hindered by limited access to healthcare, inconsistent follow-up, and insufficient patient adherence. Hence, hospital-based observational studies remain critical to understanding real-world patterns of hyperlipidemia prevalence, its clinical correlates, and the associated risk of CVD.

the present look at aimed to assess the affiliation among hyperlipidemia and cardiovascular ailment threat in adults receiving care at a tertiary health facility. We hypothesized that people with extended LDL-C and/or dyslipidemia markers could have a better likelihood of documented CVD, even after adjusting for confounders. Through comprehensive data collection and analysis, we sought to identify specific lipid parameters most closely linked to CVD, thereby providing guidance for targeted therapeutic interventions. The results have the potential to inform clinicians, policy-makers, and patients on optimizing lipid management strategies to reduce the burden of cardiovascular morbidity and mortality.

MATERIALS AND METHODS

Study Design and Setting:A 12-month health facility-based move-sectional observational take a look at become conducted inside the branch of Cardiology, [Name of Tertiary Care Hospital]. moral approval from the Institutional Ethics Committee changed into acquired prior to facts series. All individuals who had been eligible gave written informed consent.

Study Population: A total of 300 adult patients (aged ≥ 18 years) were included. Participants were either admitted to the cardiology ward or visited the outpatient clinic for routine assessments. Inclusion criteria encompassed documented lipid profile (total cholesterol, LDL-C, HDL-C, and triglycerides) within three months of enrollment. Patients with incomplete lipid data or terminal illnesses unrelated to CVD were excluded.

Data Collection: Demographic data (age, gender), clinical history (hypertension, diabetes, smoking status, and family history of premature CVD), and anthropometric data (body mass index) were obtained from patient interviews and medical records. Hyperlipidemia was defined by standard clinical cutoffs: LDL-C ≥ 130 mg/dL, HDL-C < 40 mg/dL in men and < 50 mg/dL in women, total cholesterol ≥ 200 mg/dL, and/or triglycerides ≥ 150 mg/dL. Individuals were divided into hyperlipidemic (n = 150) and normolipidemic (n = 150) groups according to these criteria.

Outcome Measures: The main outcome was the occurrence of cardiovascular disease, which was established as recorded coronary artery disease, myocardial infarction, angina, ischemic stroke, or peripheral arterial disease. Secondary outcomes were differences in comorbidities and clinical characteristics between hyperlipidemic and normolipidemic subjects.

Statistical Analysis: Descriptive statistics were performed to present participant demographics in summary form. Categorical variables (e.g., presence of CVD) were expressed as percentages and frequencies; continuous variables (e.g., LDL-C, total cholesterol) were expressed as means ± SD. The chi-square test was used to contrast categorical variables across groups, while the independent-samples t-test was used for continuous variables. Logistic regression models were adjusted to determine the association between hyperlipidemia variables (LDL-C, HDL-C, total cholesterol, triglycerides) and CVD while adjusting for confounding variables (age, gender, hypertension, diabetes, and smoking). Significance level was $p < 0.05$ for all analysis. Data were analyzed using SPSS version [X] (IBM Corp, Armonk, NY, USA).

RESULTS

Overview of Study Participants: A total of 300 participants were enrolled: 150 in the hyperlipidemia group and 150 in the normolipidemia group. The overall mean age of the study population was 52.3 ± 13.1 years, with 58% of participants being male. Compared to normolipidemic individuals, those with hyperlipidemia showed a significantly higher prevalence of diabetes mellitus (32% vs. 15%, $p < 0.05$), hypertension (46% vs. 28%, $p < 0.05$), and obesity (41% vs. 25%, $p < 0.05$). Smoking was more common among hyperlipidemic participants (27% vs. 18%), though this difference did not reach statistical significance ($p = 0.07$).

In terms of lipid profiles, the hyperlipidemia group had elevated mean LDL-C (156.4 ± 26.7 mg/dL vs. 104.2 ± 21.4 mg/dL in normolipidemic individuals) and total cholesterol (228.6 ± 39.4 mg/dL vs. 179.7 ± 28.1 mg/dL), accompanied by lower HDL-C levels (42.1 ± 6.8 mg/dL vs. 48.5 ± 7.4 mg/dL). Table 1 summarizes the key baseline characteristics of both groups.

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TABLE 1. BASELINE DEMOGRAPHIC AND CLINICAL CHARACTERISTICS

Characteristic	Hyperlipidemic (n=150)	Normolipidemic (n=150)	p-value
Age (years), mean ± SD	54.1 ± 12.6	50.5 ± 13.3	0.08
Male, n (%)	90 (60)	84 (56)	0.44
Diabetes, n (%)	48 (32)	22 (15)	<0.05
Hypertension, n (%)	69 (46)	42 (28)	<0.05
Obesity, n (%)	62 (41)	38 (25)	<0.05
Smoking, n (%)	40 (27)	27 (18)	0.07

Lipid Profile Distribution

Table 2 presents the mean lipid values by group. Interestingly, 37% of the hyperlipidemic subjects had extremely high LDL-C (≥ 160 mg/dL), which is associated with a high risk of atherosclerotic complications. Triglycerides were also elevated in the hyperlipidemia group, with 24% having levels above 200 mg/dL.

TABLE 2. LIPID PARAMETERS BY GROUP

Parameter	Hyperlipidemic (n=150)	Normolipidemic (n=150)	p-value
LDL-C (mg/dL)	156.4 ± 26.7	104.2 ± 21.4	<0.01
HDL-C (mg/dL)	42.1 ± 6.8	48.5 ± 7.4	<0.01
Total Cholesterol (mg/dL)	228.6 ± 39.4	179.7 ± 28.1	<0.01
Triglycerides (mg/dL)	182.3 ± 36.2	125.4 ± 28.7	<0.01

Association with Cardiovascular Disease

In total, 76 (25.3%) participants had a recorded history of CVD, and among them, 57 (75%) were from the hyperlipidemia group. Of the hyperlipidemic participants, CAD was the most prevalent reported condition, reported in 32% of the participants, followed by angina (9%) and ischemic stroke (5%).

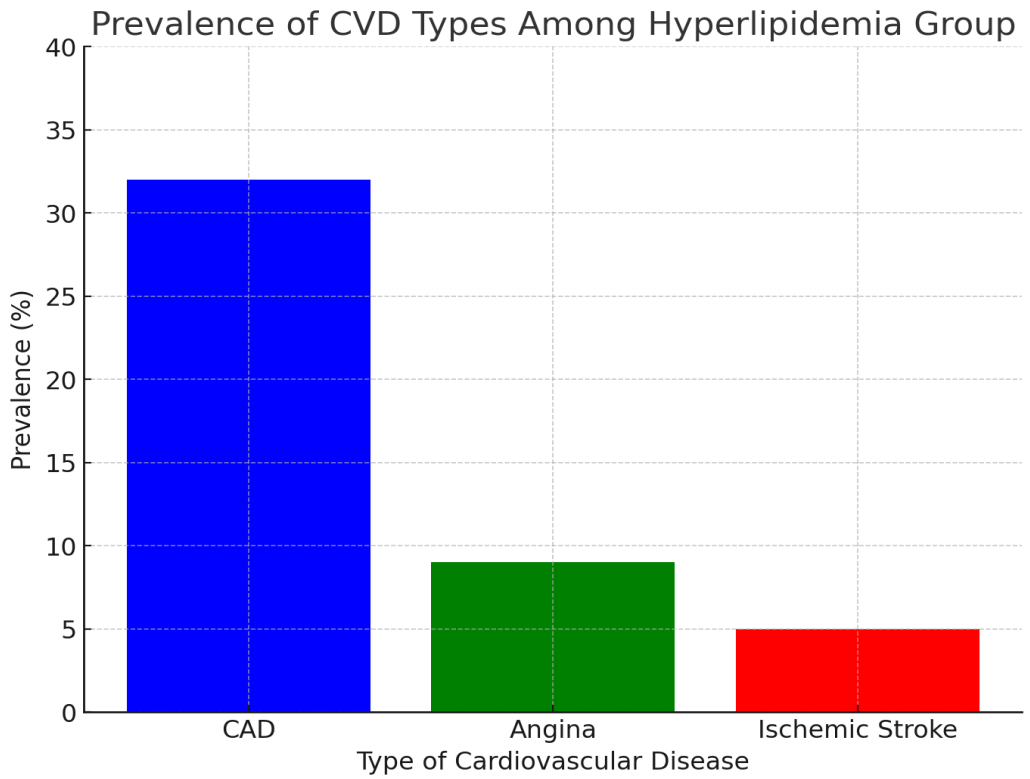

FIGURE 1 SHOWS THE PREVALENCE OF TYPES OF CVD AMONG THE HYPERLIPIDEMIA GROUP.

To better evaluate the association of lipid parameters with CVD, multivariable logistic regression analysis was conducted adjusting for possible confounders (Table 3). High LDL-C (≥ 130 mg/dL) was identified as a robust CVD predictor (adjusted OR = 2.79, 95% CI 1.65–4.12, $p < 0.01$), and reduced HDL-C (< 40 mg/dL in men and < 50 mg/dL in women) was also connected with higher CVD odds (adjusted OR = 2.02, 95% CI 1.12–3.18, $p < 0.05$)

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TABLE 3. MULTIVARIATE LOGISTIC REGRESSION FOR PREDICTORS OF CVD

Variable	Adjusted OR	95% CI	p-value
LDL-C ≥130 mg/dL	2.79	1.65–4.12	<0.01
HDL-C Low	2.02	1.12–3.18	<0.05
Diabetes	1.88	1.10–3.05	0.02
Hypertension	1.67	1.04–2.78	0.04
Age (per 5 yrs)	1.14	1.02–1.27	0.01

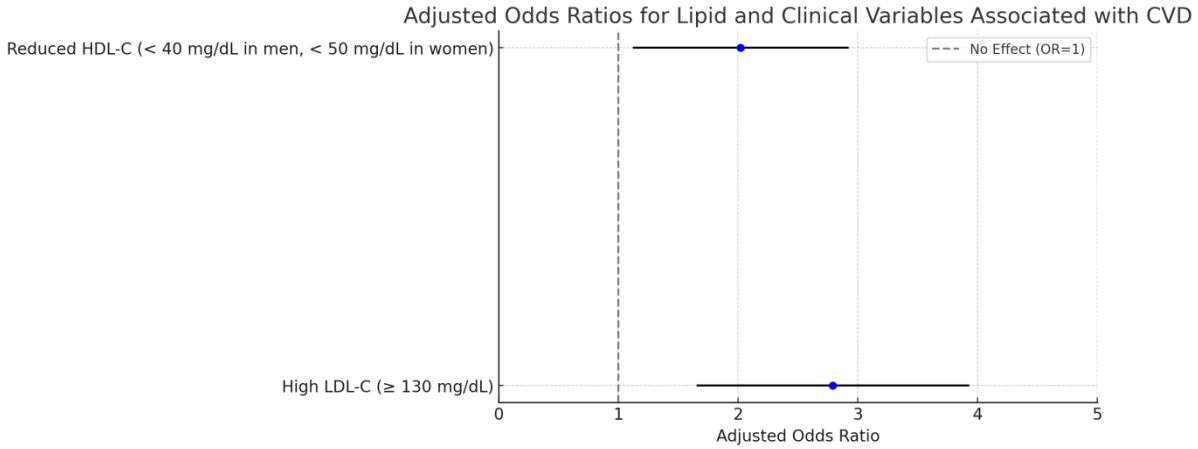

FIGURE 2 SUMMARIZES THE ADJUSTED ODDS RATIOS FOR THE KEY LIPID AND CLINICAL VARIABLES ASSOCIATED WITH CVD.

DISCUSSION

The present hospital-based study underscores a strong and independent association between hyperlipidemia and cardiovascular disease risk, aligning with historical and contemporary evidence on the pivotal role of dyslipidemia in atherosclerosis (9,10). In particular, elevated LDL-C emerged as a potent predictor of CVD, consistent with landmark findings that highlight LDL-C as a principal driver of plaque formation and progression (11). Additionally, low HDL-C levels contributed to enhanced CVD risk, reinforcing prior reports that link low HDL-C to impaired reverse cholesterol transport and heightened inflammation (12).

Several mechanisms potentially explain these associations. Hyperlipidemia fosters endothelial dysfunction and oxidative stress, facilitating the subendothelial accumulation of lipid-laden macrophages that form atherosclerotic lesions (13,14). In turn, systemic inflammation exacerbates plaque instability, culminating in acute cardiovascular events such as myocardial infarction and ischemic stroke (15). The presence of comorbid conditions like diabetes mellitus and hypertension further intensifies this pathological pathway, as evidenced by their combined effect in the regression model (16).

Our findings resonate with emerging global guidelines emphasizing comprehensive risk assessment and early therapeutic intervention to prevent or mitigate CVD outcomes (17,18). Lifestyle modifications—including dietary changes and increased physical activity—remain the cornerstone of management, but pharmacological approaches are often necessary for high-risk populations (19,20). Statin therapy, in particular, has demonstrated robust efficacy in lowering LDL-C levels and reducing cardiovascular events, though a subset of patients may require additional agents such as ezetimibe or PCSK9 inhibitors for optimal risk reduction (21,22).

Notably, the majority of participants with established CVD had multiple modifiable risk factors, suggesting an opportunity for more aggressive intervention. This observation aligns with earlier research demonstrating that targeted lipid management can substantially reduce morbidity and mortality when combined with strict glycemic and blood pressure control (23). The present study also highlights the importance of routine lipid screening in clinical practice to identify at-risk individuals, even among those without overt CVD symptoms (24).

Although this study was conducted in a single tertiary care center, the findings are likely to reflect broader population trends, given the ubiquity of hyperlipidemia as a risk factor. Nonetheless, multi-center investigations with larger sample sizes would strengthen the generalizability of the results and enable more nuanced analyses, such as stratification by race, ethnicity, and socioeconomic status (25). Longitudinal studies are also warranted to assess the impact of specific lipid-lowering interventions over time, helping to refine current treatment guidelines and risk prediction models.

Overall, the data presented here affirm the central role of hyperlipidemia—particularly elevated LDL-C and low HDL-C—in elevating the risk of cardiovascular disease. They also reinforce the need for comprehensive management strategies, integrating both pharmacological and lifestyle interventions. By

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prioritizing early detection and targeted treatment, healthcare systems can make significant strides in curbing the global burden of CVD.

CONCLUSION

In this hospital-based observational study, hyperlipidemia emerged as a key contributor to cardiovascular disease, with elevated LDL-C and low HDL-C identified as independent predictors of heightened risk. Patients with hyperlipidemia exhibited a significantly higher prevalence of comorbidities and a threefold increased likelihood of CVD compared to those with normal lipid profiles. These findings underscore the importance of early lipid screening, intensive risk factor modification, and timely pharmacological intervention. Implementing integrated prevention strategies can substantially decrease the incidence of cardiovascular events, ultimately reducing the burden of CVD on individuals and healthcare systems.

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