ORIGINAL RESEARCH PAPER

Community Medicine

"COMPREHENSIVE ANALYSIS OF LIPID PROFILE COMPONENTS AND THEIR ROLE IN CARDIOVASCULAR RISK ASSESSMENT IN PATIENTS ATTENDING A TERTIARY CARE HOSPITAL IN SOUTH GUJARAT: A CROSS-SECTIONAL STUDY"

KEY WORDS: Cardiovascular Disease, Dyslipidaemia, Lipid Profile, Risk Assessment

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ABSTRACT

Introduction: Cardiovascular diseases (CVDs) are a leading cause of mortality worldwide, with unfavourable lipid profiles recognized as a critical risk factor. **Aim and Objective:** This study aims to investigate the role of lipid profiles in cardiovascular risk assessment among patients attending a tertiary care hospital in South Gujarat. **Methodology** This cross-sectional study, conducted in 160 participants selected purposively from June 1st to June 30th, aimed to assess lipid profile abnormalities in adults aged 18 and older. Participants were included if they had complete lipid profile tests (total cholesterol, LDL, HDL, triglycerides) and provided informed consent. Exclusions applied to those with incomplete results, acute cardiovascular conditions, recent myocardial infarction, or secondary dyslipidaemia. Statistical analysis was performed using MS Excel (Version 21) and SPSS software (Version 26). **Results:** The study found a mean total cholesterol level of 220 mg/dL among participants, with significant correlations identified between high LDL cholesterol and hypertension ($r = 0.42$, $p < 0.01$), low HDL cholesterol and a sedentary lifestyle ($r = -0.35$, $p < 0.05$), and elevated triglycerides and diabetes ($r = 0.40$, $p < 0.01$). However, no significant associations were observed between lipid levels and factors such as gender, physical activity, and age. **Conclusion:** The findings reveal a high prevalence of dyslipidaemia linked to cardiovascular risk factors. This underscores the need for targeted public health interventions in South Gujarat. Further research is required to explore additional variables affecting cardiovascular health in this group.

INTRODUCTION:

Cardiovascular diseases (CVDs) are the leading cause of death globally, responsible for 17.9 million deaths annually, accounting for 31% of all global deaths (Koohi et al., 2021). An unfavorable lipid profile is a key risk factor for the development and progression of CVD (Dayimu et al., 2019). Standard lipid profiles measure plasma concentrations of total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides (Nordestgaard et al., 2016). Elevated levels of total cholesterol (TC), triglycerides (TG), LDL cholesterol, and low levels of HDL cholesterol are strongly linked to CVD risk (Koohi et al., 2021). This study assesses the role of lipid profiles in cardiovascular risk among patients at a tertiary care hospital in South Gujarat.

MATERIALS AND METHODS:

This cross-sectional study was conducted over one month, from June 1st to June 30th, to assess lipid profile abnormalities among patients aged 18 years and older. To be included in the study, participants needed to have recorded lipid profile tests, including total cholesterol, LDL cholesterol, HDL cholesterol, and triglycerides, in their medical records, and they had to provide informed consent to participate. Patients were excluded if they had incomplete or missing lipid profile results, acute cardiovascular conditions, recent myocardial infarction, or secondary dyslipidaemia due to conditions such as nephrotic syndrome, hypothyroidism, or primary liver disease. The study aimed to estimate the prevalence of abnormal lipid levels, for which a pilot study conducted with 10 participants revealed a 10% prevalence rate. Using this data, the sample size for the main study was calculated to be 160 participants, allowing for a 10% increase to account for potential biases, with a confidence level of 95% and a margin of error of 5%. Participants were selected through purposive sampling to represent the study population accurately. Data was collected using a structured questionnaire that captured demographics, medical history, lifestyle factors, clinical features, and lipid profile results. This included information on age, gender, family history of cardiovascular disease (CVD), comorbid conditions such as hypertension, diabetes, obesity, and hyperlipidaemia, as well as lifestyle factors like smoking, alcohol consumption, dietary habits, and physical activity. Participants were also queried on symptoms associated with cardiovascular risk, such as chest pain, shortness of breath, and fatigue. Lipid profile data were extracted from patients' medical records. Data was entered in Microsoft Excel (Version 2021), and subsequent analysis was conducted using SPSS software (Version 26).

RESULT:

The study enrolled 160 participants with a mean age of 50.2 years. Of the participants, 58% were male. A family history of cardiovascular disease (CVD) was reported in 34% of participants. The prevalence of hypertension, diabetes, obesity, and hyperlipidaemia were 45%, 30%, 28%, and 60%, respectively. Regarding lifestyle factors, 25% of participants were current smokers, 20% consumed alcohol regularly, and 50% led a sedentary lifestyle. The most commonly reported

symptoms were chest pain (20%), shortness of breath (25%), and fatigue (30%). (Table 1)

Table 1: Baseline Characteristics of Participants (n = 160)

Characteristic		n = 160 (100%)
Family history of CVD	**Yes**	54 (34%)
	No	106 (66%)
Comorbidities	**Hypertension**	72 (45%)
	Diabetes	48 (30%)
	Obesity	45 (28%)
	Hyperlipidaemia	96 (60%)
Lifestyle Factors	**Current smoker**	40 (25%)
	Regular alcohol consumption	32 (20%)
	Sedentary lifestyle	80 (50%)
Symptoms	**Chest pain**	32 (20%)
	Shortness of breath	40 (25%)
	Fatigue	48 (30%)

The analysis of lipid profiles revealed a mean total cholesterol level of 220 mg/dL with a standard deviation (SD) of 35 mg/dL. The mean LDL cholesterol level was 140 mg/dL (SD: 30 mg/dL), the mean HDL cholesterol level was 40 mg/dL (SD: 10 mg/dL), and the mean triglycerides level was 180 mg/dL (SD: 45 mg/dL). (Table 2)

Table 2: Lipid Profile Results (n = 160)

Lipid Profile Component	Mean (mg/dL)	Standard Deviation (SD)
Total Cholesterol	220	35
LDL Cholesterol	140	30
HDL Cholesterol	40	10
Triglycerides	180	45

Correlation analysis demonstrated significant relationships between specific lipid profile components and cardiovascular risk factors. Notably, high LDL cholesterol levels were significantly correlated with hypertension ($r = 0.42$, $p < 0.01$), low HDL cholesterol levels were significantly correlated with a sedentary lifestyle ($r = -0.35$, $p < 0.05$), and elevated triglyceride levels were significantly correlated with diabetes ($r = 0.40$, $p < 0.01$). (Table 3)

Table 3: Correlations between Lipid Profile Components and Cardiovascular Risk Factors (n = 160)

Risk Factor	Correlation with Lipid Component	r	p-value
Hypertension	LDL Cholesterol	0.42	<0.01
Sedentary lifestyle	HDL Cholesterol	-0.35	<0.05
Diabetes	Triglycerides	0.40	<0.01

Additionally, Chi-square tests identified a significant association between dyslipidaemia and a family history of CVD ($p < 0.05$).

The statistical analysis of the study revealed no significant relationships among various factors related to lipid profiles.

An independent t-test showed no significant difference in mean LDL cholesterol levels between male and female participants, with a t-statistic of 1.263 and a p-value of 0.209, indicating that gender does not significantly affect LDL cholesterol levels ($p > 0.05$).

Similarly, a chi-square test examining the association between physical activity and hyperlipidaemia yielded a chi-square statistic of 0.058 and a p-value of 0.971, suggesting no significant relationship between physical activity levels and the presence of hyperlipidaemia ($p > 0.05$).

A Pearson correlation analysis between age and total cholesterol levels resulted in a weak and non-significant positive correlation, with a correlation coefficient (r) of 0.104 and a p-value of 0.190, implying that age does not significantly influence total cholesterol levels ($p > 0.05$).

A multiple regression analysis aimed at predicting total cholesterol levels based on age, gender, and smoking status revealed that the model explained only 1.6% of the variance in total cholesterol levels. None of the predictors, including age, gender, and smoking status, were statistically significant, with p-values greater than 0.05. The F-statistic of 0.844 and p-value of 0.472 further confirmed the model's lack of significance, indicating that these factors may not have a strong impact on total cholesterol in this dataset.

DISCUSSION

This study identifies a high prevalence of cardiovascular risk factors: hypertension (45%), diabetes (30%), obesity (28%), and hyperlipidemia (60%). These results align with recent Indian studies, such as the ICMR-INDIAB study, which reported hypertension and diabetes prevalence at 33% and 11%, respectively (Anjana et al., 2023). Our findings on hypertension are consistent, but the diabetes prevalence is higher in our sample. The obesity rate of 28% exceeds the 19% reported by ICMR-INDIAB, while hyperlipidemia remains a common concern across studies.

The mean lipid profile values were: total cholesterol 220 mg/dL, LDL cholesterol 140 mg/dL, HDL cholesterol 40 mg/dL, and triglycerides 180 mg/dL. These are similar to values in other studies (Prabhakaran et al., 2018), although our HDL cholesterol was slightly lower. Significant correlations were observed: high LDL cholesterol with hypertension ($r = 0.42$), low HDL cholesterol with a sedentary lifestyle ($r = -0.35$), and elevated triglycerides with diabetes ($r = 0.40$). These align with existing literature on cardiovascular risk (Sharma et al., 2024; Koohi et al., 2021).

There was no significant gender difference in LDL cholesterol levels ($t = 1.263$, $p = 0.209$), consistent with the CURES study, which found similar LDL levels across genders but noted different cardiovascular risk profiles (Pradeepa et al., 2008). The Chi-square test revealed no significant association between physical activity and hyperlipidemia ($2 = 0.058$, $p = 0.971$), which contrasts with studies suggesting physical activity impacts lipid levels (Rafieian-Kopaei et al., 2014).

A weak correlation between age and total cholesterol levels ($r = 0.104$, $p = 0.190$) suggests that age alone is not a strong predictor, supporting findings that lifestyle and genetic factors play a more significant role (Rafieian-Kopaei et al., 2014; Sharma et al., 2024).

The multiple regression analysis explained only 1.6% of the variance in total cholesterol levels ($R2 = 0.016$, $p = 0.472$), highlighting the complexity of cholesterol regulation, which is influenced by a broad range of factors beyond those considered in this study.

CONCLUSION:

This study aligns with recent Indian research, highlighting a high burden of hypertension, diabetes, obesity, and hyperlipidemia, reinforcing the need for targeted public health measures. Strong correlations between lipid profile components and cardiovascular risk factors underscore the critical role of dyslipidemia management in reducing CVD risk. The absence of significant findings in areas like physical activity and cholesterol predictors suggests further research is needed to identify additional factors affecting cardiovascular health in India.

REFERENCES

1. Anjana, R.M. et al. (2023) 'Metabolic non-communicable disease health report of India: the ICMR-INDIAB national cross-sectional study (ICMR-INDIAB-17)', The Lancet Diabetes and Endocrinology, 11(7), pp. 474–489. Available at: https://doi.org/10.1016/S2213-8587(23)00119-5.
2. Dayimu, A., Wang, C., Li, J., Fan, B., Ji, X., Zhang, T., & Xue, F. (2019). Trajectories of Lipids Profile and Incident Cardiovascular Disease Risk: A Longitudinal Cohort Study. Journal of the American Heart Association, 8(21).

https://doi.org/10.1161/JAHA.119.013479
3. Koohi, F. et al. (2021) 'Multi-trajectories of lipid indices with incident cardiovascular disease, heart failure, and all-cause mortality: 23 years follow-up of two US cohort studies', Journal of Translational Medicine, 19(1), pp. 1–13. Available at: https://doi.org/10.1186/s12967-021-02966-4.
4. Nordestgaard, B. G., Langsted, A., Mora, S., Kolovou, G., Baum, H., Bruckert, E., Watts, G. F., Sypniewska, G., Wiklund, O., Borén, J., Chapman, M. J., Cobbaert, C., Descamps, O. S., Von Eckardstein, A., Kamstrup, P. R., Pulkki, K., Kronenberg, F., Remaley, A. T., Rifai, N., … Langlois, M. (2016). Fasting is not routinely required for determination of a lipid profile: Clinical and laboratory implications including flagging at desirable concentration cut-points - A joint consensus statement from the European Atherosclerosis Society and European Fede. European Heart Journal, 37(25), 1944–1958. https://doi.org/10.1093/eurheartj/ehw152
5. Prabhakaran, D. et al. (2018) 'The changing patterns of cardiovascular diseases and their risk factors in the states of India: the Global Burden of Disease Study 1990–2016', The Lancet Global Health, 6(12), pp. e1339–e1351. Available at: https://doi.org/10.1016/S2214-109X(18)30407-8.
6. Pradeepa, R. et al. (2008) 'Prevalence and risk factors for diabetic neuropathy in an urban south Indian population: The Chennai Urban Rural Epidemiology Study (CURES-55)', Diabetic Medicine, 25(4), pp. 407–412. Available at: https://doi.org/10.1111/j.1464-5491.2008.02397.x.
7. Rafieian-Kopaei, M. et al. (2014) 'Atherosclerosis: Process, Indicators, Risk Factors and New Hopes', International Journal of Preventive Medicine, 5(8), p. 927. Available at: /pmc/articles/PMC4258672/ (Accessed: 17 August 2024).
8. Sharma, S., Gaur, K. and Gupta, R. (2024) 'Trends in epidemiology of dyslipidemias in India', Indian Heart Journal, 76(S1), pp. S20–S28. Available at: https://doi.org/10.1016/j.ihj.2023.11.266.