

Association of Serum Cholesterol and Platelet Larger Cell Ratio (P-LCR) in General Population

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Abstract:

Introduction: Hyperlipidemia is a disorder in which lipid and cholesterol levels in the blood are elevated. It is also known as dyslipidemia, which refers to a variety of lipoprotein metabolism abnormalities. Although an elevated amount of low-density lipoprotein (LDL) and cholesterol in the blood is regarded to be a conventional risk factor for atherosclerosis. Platelet-large cell ratio (P-LCR) is defined as the percentage of platelets that exceed the normal value of platelet volume of 12 fL in the total platelet count. Platelet size has been shown to reflect platelet activity. In general population, higher MPV and P-LCR values are observed in CAD patients compared to patients without coronary atherosclerosis. Therefore P-LCR indices, combined with other prognostic parameters, may be an important element of various scoring systems used in long-term prognosis in both stable CAD and ACS. Thus this study to study role of platelet function in hyperlipidemic patients.

Methods: A cross sectional study conducted from November 2022 to January 2023. This study was started after taking permission from institutional ethical committee. All the patients with hyperlipidemia who gave consent to be part of the study were included. The study excluded patients who had any cardiovascular illness, bleeding problems, or was using anti-platelets, anti-coagulants, or lipid-lowering medicines. Thrombocytopenia, anemia, cancer, pregnancy, recent blood transfusion history, infections and chemotherapy.

Results: The mean age of the study participants was found to be 54.22±14.8 years. 65% of the study participants >50 years, followed by 16% being 41-50 years. Majority of the participants of the study participants male (60%). Association between cholesterol and gender showed that there was no significant association across gender and cholesterol levels with p value= 0.445. It was found that there was no significant association across cholesterol and age group with p value= 0.934. No significant association across was found across cholesterol and P-LCR with p value= 0.824 in our study.

Keywords: Serum Cholesterol, platelet-larger cell ratio, P-LCR.

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Introduction

An increased level of lipids and cholesterol in the blood is referred to as hyperlipidemia. It is sometimes referred to as dyslipidemia, which covers a wide range of disorders in lipoprotein metabolism. Although a higher than normal blood level of cholesterol and low-density lipoprotein (LDL) is thought to be a traditional risk factor for atherosclerosis [1], it is not the only risk factor. High total cholesterol (TC), high triglycerides (TGs), low levels of high-density lipoprotein (HDL) and cholesterol are all considered to be signs of hyperlipidemia. The American Heart Association defines hyperlipidemia as an increased level of blood fats. These fats include TGs and cholesterol, for

instance. A substantial risk factor for coronary heart disease, stroke, and heart attack appears to be hyperlipidemia[2]. Hyperlipidemia is frequently associated with conditions like diabetes, coronary heart disease, obesity, and hypertension [3,4]. Although their major function is to maintain hemostasis by starting blood coagulation, platelets have been demonstrated to play a part in the thrombus repercussions of atheromatous damage in hyperlipidemic patients by starting and spreading atherosclerotic plaques [5]. Platelets bind to areas of arterial endothelial damage and produce mitogenic substances, such as tumour growth factor (TGF) and

platelets derived growth factor (PDGF), which aid in the development of atherosclerosis in its early stages [6]. In comparison to platelets of smaller sizes, larger platelets are assumed to be more metabolically, enzymatically, and functionally agile [7]. These larger platelets release more thromboxane B₂ than ordinary platelets during steady-state operation. Larger platelets are more hemostatically active and are hence more likely to thrombus formation. So, to indirectly measure platelet activity, platelet size or mean platelet volume (MPV) is used [8]. The majority of clinical laboratories now routinely offer platelet count (PC) and platelet volume indicators (PVI), such as MPV, platelet distribution width (PDW), and platelet-large cell ratio (P-LCR), at no additional cost. The percentage of platelets in the total platelet count that are larger than the average platelet volume of 12 fL is known as the platelet-large cell ratio (P-LCR). Since it has been demonstrated that platelet size reflects platelet activity, measuring MPV (Mean Platelet Volume) and P-LCR is a quick and straightforward way to evaluate indirect platelet stimulation. In all phases of the development of an atherosclerotic lesion, platelets play a crucial function as a connection between thrombosis and inflammation. In the course of coronary artery disease (CAD), increased platelet activity and their propensity to clot favour the frequency of thrombotic complications including unstable angina pectoris (UA), myocardial infarction

(MI), and sudden cardiac death. The average size of platelets is represented by the mean platelet volume (MPV), which typically ranges from 7.5 to 10.5 fL. In the general population, CAD patients have greater MPV and P-LCR levels than patients without coronary atherosclerosis. As a result, P-LCR indices may be a significant component of the many scoring systems used in long-term prediction in both stable CAD and ACS⁹ when paired with other prognostic indicators. Thus this study is conducted to study the role of platelet function in hyperlipidemic patients.

Methodology

A cross sectional study conducted at the Department of Pathology, from November 2022 to January 2023. This study was started after taking permission from institutional ethical committee. All the patients with hyperlipidemia who gave consent to be part of the study were included. The study excluded patients who had any cardiovascular illness, bleeding problems, or was using anti-platelets, anti-coagulants, or lipid-lowering medicines. Thrombocytopenia, anemia, cancer, pregnancy, recent blood transfusion history, infections and chemotherapy. The gathered information was tabulated in an Excel spreadsheet by Microsoft, and computerised analysis was done by SPSS [17]. (SPSS, Chicago, IL, USA).

Results

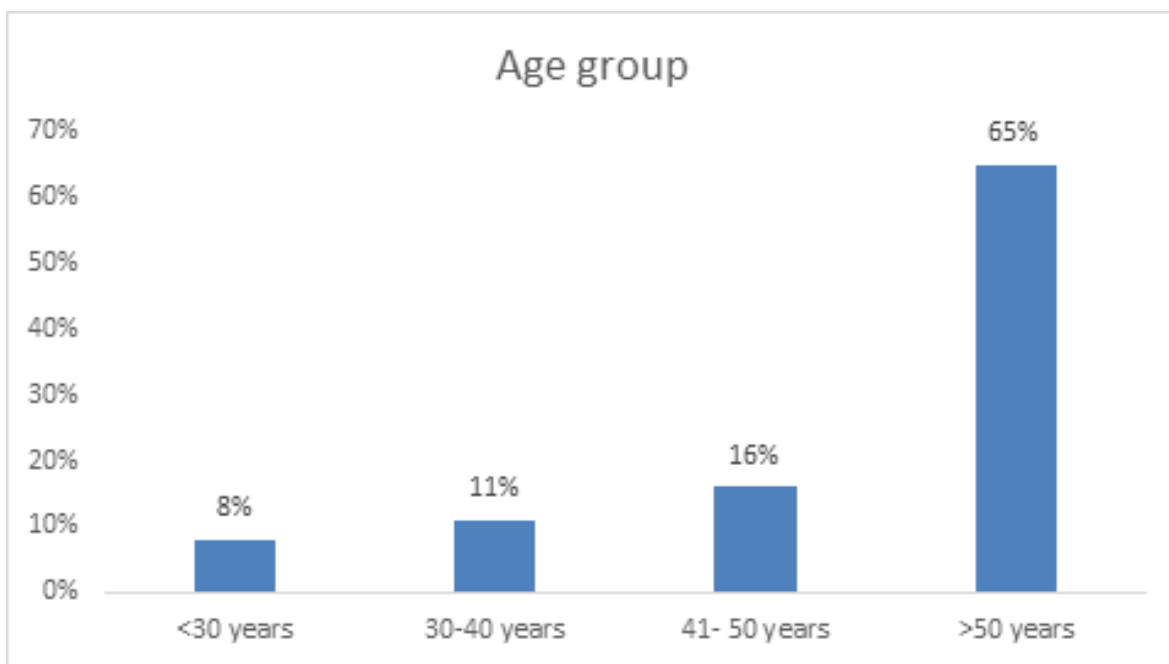


Figure 1: Distribution of the study participants according to the age group

Figure 1 shows distribution of the study participants according to the age group. Result showed that 65% of the study participants >50 years.

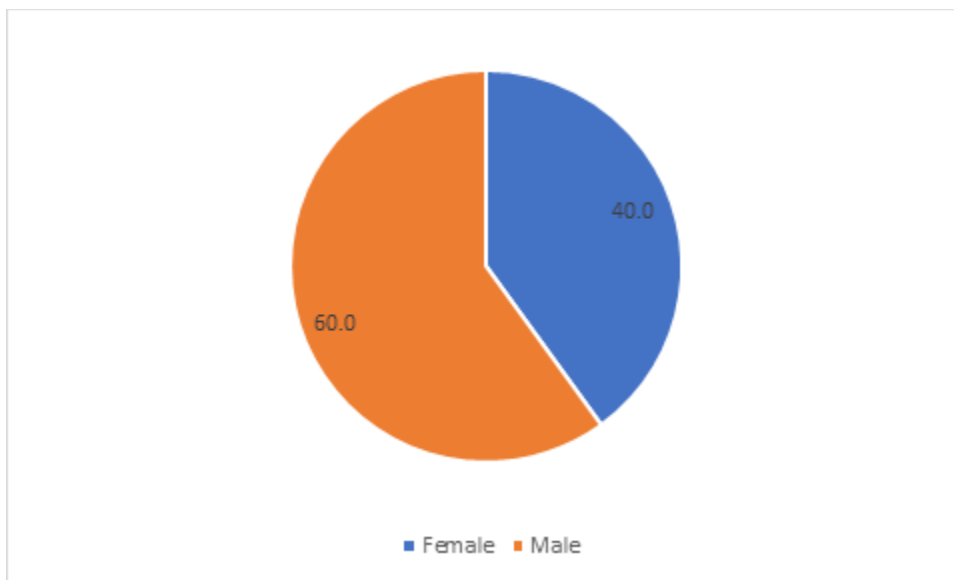


Figure 2: Gender wise distribution of study participants

Figure 2 shows gender wise distribution of study participants. Results showed that majority of the participants of the study participants male (60%).

Table 1: Association between cholesterol and gender

		Gender		Total
		Female	Male	
Cholesterol	Normal	26	46	72
		65.0%	76.7%	72.0%
	Borderline high (200-239 mg/dL)	11	11	22
		27.5%	18.3%	22.0%
	High (>240mg/dL)	3	3	6
		7.5%	5.0%	6.0%
Total		40	60	100
		100.0%	100.0%	100.0%

P value= 0.445

Table 1 shows association between cholesterol and gender. It was found that there was no significant association across gender and cholesterol levels with p value= 0.445

Table 2: Association between cholesterol and age group

		Age group				Total
		<30 years	30-40 years	41- 50 years	>50 years	
Cholesterol	Normal	6	8	11	47	72
		75.0%	72.7%	68.8%	72.3%	72.0%
	Borderline high (200-239 mg/dL)	2	3	4	13	22
		25.0%	27.3%	25.0%	20.0%	22.0%
	High (>240 mg/dL)	0	0	1	5	6
		0.0%	0.0%	6.3%	7.7%	6.0%
Total		8	11	16	65	100
		100.0%	100.0%	100.0%	100.0%	100.0%

P value= 0.934

Table 2 shows association between cholesterol and age group. It was found that there was no significant association across cholesterol and age group with p value= 0.934

Table 3: Association between cholesterol and P-LCR

Cholesterol	N	Mean P-LCR	Std. Deviation
Borderline high (200-239 mg/dL)	22	38.3199	15.50782
High (≥ 240 mg/dL)	6	40.4500	10.33030

F value=0.193, p value=0.824

Table 2 shows association between cholesterol and P-LCR. It was found that there was no significant association across cholesterol and P-LCR with p value= 0.824

Discussion

The current study was conducted on general patients to study role of platelet function in hyperlipidemic patients. The mean age of the study participants was found to be 54.22 ± 14.8 years. 65% of the study participants >50 years, followed by 16% being 41-50 years. Majority of the participants of the study participants male (60%). Association between cholesterol and gender showed that there was no significant association across gender and cholesterol levels with p value= 0.445.

It was found that there was no significant association across cholesterol and age group with p value= 0.934. No significant association across was found across cholesterol and P-LCR with p value= 0.824 in our study. E Babu et al [10] found the mean platelet P-LCR in control group to be 23.6 ± 7.4 and they concluded that Platelet Large Cell Ratio if properly utilized can be a good aid in the differential diagnosis of conditions associated with abnormal platelet counts. Reddy SR et al [11] found P-LCR was 22.64 ± 7.13 . Grotto HZ et al [12] found that P-LCR values were significantly higher in dyslipidemia patients ($n = 41$) than in control normal group ($n = 20$) ($P < 0.0001$). Larger platelets are more reactive and contribute to vasoocclusive events in patients with dyslipidemia. P-LCR may be used as an indicator of risk factor for thromboembolic ischemic events. Similarly Tseng et al [13] et al also found that P-LCR values were higher in dyslipidemia group.

Hyperlipidemia is a disorder in which lipid and cholesterol levels in the blood are elevated. Platelets have been shown to have a role in the thrombus consequences of atheromatous damage in hyperlipidemic individuals by initiating and propagating atherosclerotic plaques. Platelets with bigger diameters are thought to be more metabolically, enzymatically, and functionally agile than platelets with lower sizes. In steady-state operation, these bigger platelets release more thromboxane B₂ than regular platelets. Platelets with bigger sizes are more hemostatically active and hence have a higher chance of forming a thrombus and thromboembolism. The aim of this study was to compare the values of P=L-CR in high cholesterol patients with normal age and sex-matched controls. P-LCR parameter is a significant,

easy, and cost-effective method for predicting future acute episodes in hyperlipidemic patients that should be utilized more widely.

To avoid vascular events, these individuals may require higher antiplatelet dosages and more rigorous hyperlipidemia therapy.

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