



Hyperlipidemic Platelets in Blood Donors: A Correlative Study in North Indian Population

S. Nishat Fatima Rizvi^{1,2}, Tulika Chandra^{1*}, Abbas Mahdi² and Devisha Agarwal¹

¹ Department of Transfusion Medicine and Blood Bank, King George's Medical University, Uttar Pradesh, India

² Department of Biochemistry, King George's Medical University, Uttar Pradesh India

*Corresponding e-mail: drtulikachandra@gmail.com

ABSTRACT

Background: Elevated plasma levels of low-density lipoproteins are an important risk factor for heart diseases and the premature start of atherosclerosis. **Objectives:** The aim of this study is to assess the correlation between lipid profile and platelets parameters of blood donors and to find out the association of platelet volume indices with heart diseases. **Materials and methods:** A cross-sectional study was done involving blood donors (n=80) from the Department of Transfusion Medicine, King George's Medical University Lucknow (June 2015-December 2015). Medical history from blood donors by questionnaire was taken and lipid levels were analyzed by blood samples. **Results:** Out of 80 blood samples 30 were hyperlipidemic and 50 were normolipidemic. There was statistical significance in sex age and weight ($p=0.05$) in hyperlipidemic groups. Platelet parameters were also significantly higher in hyperlipidemic groups as well as a significant association was found between hyperlipidemia on the basis of the donor's weight and platelet parameters ($p=0.05$). **Conclusion:** Elevated platelet volume indices are an increased risk of heart diseases with hyperlipidemia. Further studies on larger sample size need to establish the observation.

Keywords: Platelet volume indices, Hyperlipidemia, Atherosclerosis, Lipid levels

INTRODUCTION

Hyperlipidemia especially elevated plasma concentrations of low-density lipoproteins (LDL) is an important risk factor for the premature onset of atherosclerosis and ischemic heart disease [1]. Low-density lipoproteins (LDL) and platelets are thought to be a risk factor for the development of heart diseases. It has been demonstrated that oxidized LDL (oxLDL) increase platelet aggregation by means of enhanced sensitivity to agonists and a reduction of platelet nitric oxide (NO) synthase (NOS) expression and activity [2]. Activated platelets, in turn, secrete a protein like a factor that stimulates the uptake of oxLDL by macrophages [3]. By the use of automated hematology analyzers, platelet count and the platelet volume indices (PVIs) are easily available with no additional cost in many clinical laboratories. And by these indices, a close association could be established with hyperlipidemia that can be shown by a slight change in platelet size. These indices can be used as early, cost-effective and identification of heart diseases and which can be more effective heart disease risk predictors than a single serum lipid value (e.g., Tchol, HDL, or LDL) [4]. The current study aimed to assess the correlation between lipid profile and platelets parameters of blood donors and to find out the association of platelet volume indices with heart diseases. The exclusion criteria for donor selection and making blood transfusions safer would be done by screening hyperlipidemia in blood donors and correlating it with platelet parameters.

MATERIALS AND METHODS

A cross-sectional study was done involving blood donors (n=80) from the Department of Transfusion Medicine, King George's Medical University Lucknow (June 2015-December 2015). Medical history from blood donors by questionnaire was taken at the time of donation. Written informed consent of each participant was taken and the study protocol was approved by the institutional ethics committee. Subjects with age between 18-65 years were enrolled for the study.

Inclusion Criteria

The inclusion criteria for the subject selection were hemoglobin level >12.5 gm/dl and weight 45 kg or more, the pulse rate: 60 to 100 per minute and regular, blood pressure: systolic 100-180 mm of mercury; diastolic 50-100 mm of h.

Exclusion Criteria

Exclusion criteria were donors with the previous transfusion within 6 month or previous donation within 3 months. A donor with a known cardiac problem, endocrinal disorder, thyroid disorder, diabetes (on insulin therapy), hypertension, subjects undergoing medication like NSAIDs, steroids, anticancer drugs, were also excluded from the study.

A questionnaire was used to record general information. After 350 ml of blood donation, 5 ml of blood was collected in plain vial, serum was separated after centrifugation and different parameters of lipid was assessed by fully automated analyzer (TRIGL: triglycerides, LDL-C: LDL-cholesterol plus 2nd generation, CHOL 2: Cholesterol Gen 2, HDL-C 3: HDL-Cholesterol plus 3rd generation, Cobas C311-Roche Diagnostic. Chi-square and p-value were evaluated to know the association.

Ethical Considerations

The ethics committee of King George's Medical University approved the study. Voluntary blood donation was done and written informed consent was taken from blood donors.

RESULTS

A total of 80 blood donors were enrolled in the study, out of that 30 samples were found to be hyperlipidemic, in which 22 were male and 8 were female. The donors were aged between 18-65 years. The cases showed a significant association between lipid level and platelet parameters as compared to control subjects. Results were tabulated as out of 80 blood samples 30 were hyperlipidemic and 50 were normolipidemic. There were significant differences in sex ($p < 0.05$) age and weight in hyperlipidemic groups. The platelet parameters including platelet count and platelet volume indices (MPV, PDW, and P-LCR) were significantly higher in hyperlipidemic groups as well as a significant association was found between hyperlipidemia on the basis of the donor's weight and platelet parameters ($p < 0.05$). These results indicated that platelet parameters were significantly higher in the hyperlipidemic blood donors (Tables 1 and 2).

Table 1 Distribution of gender, weight and age of blood donors with respect to hyperlipidemia

Parameters		Hyperlipidemia (n=30)	Chi-square (χ^2)	p-value (≤ 0.05 : significant*, ≤ 0.001 : highly significant**)
Gender	Male	22	6.53	0.030*
	Female	8		
Age	18-25 years	10	7.20	0.020*
	26-45 years	16		
	46-65 years	4		
Weight	50-70 kg	24	10.80	0.004*
	Above 70 kg	6		

Table 2 Correlation between weights, lipid profile and platelet parameters in hyperlipidemia

Weight	Lipid Profile (T chol, TG, HDL, and LDL)	Platelet Parameters (Platelet count and Platelet Volume Indices: platelet distribution width, platelet large cell ratio and mean platelet volume,		Chi-square (χ^2)	p-value (≤ 0.05 : significant*, ≤ 0.001 : highly significant**)
		Normal	Abnormal		
>70 Kg	Hyperlipidemia	1	23	4.53	0.03*
50-70 Kg	Hyperlipidemia	2	4		

Statistical analysis was done using IBM SPSS statistics version 23 (IBM, Armonk, NY, USA). Chi-square and p-value were evaluated to know the association. A p-value < 0.05 was taken to show statistically significant results.

DISCUSSION AND CONCLUSION

Platelets are thought to be the initiator of the atherosclerotic process in spite of their role in thrombus formation after plaque rupture in late atherosclerosis [5,6]. Hyperlipidemia has abnormalities in platelet composition and function indicate that circulating lipoproteins in blood influence platelet properties [7,8]. In fact, there is increasing evidence that lipoproteins affect platelet functions [9]. LDL especially oxidized LDL (OxLDL), which all contain apoprotein B-100, are atherogenic lipoproteins and increase platelet activation, whereas high-density lipoprotein (HDL) shows antiatherogenic effects on platelet function [10,11], interestingly, *in vitro* data revealed that platelets can be activated by LDL and desensitized by HDL underlining the anti-atherosclerotic properties of HDL [9]. Platelets which are larger in size tend to be more metabolically active when compared with smaller and secrete more prothrombotic factors [12]. Platelet volume indices reflect platelet reactivity [13], and it has been suggested as a risk factor for ischemic events in cardiovascular disease [14]. Various studies have shown an association of increased MPV with many types of diseases like coronary artery disease, myocardial infarction, cerebral infarction and diabetes mellitus [15-18]. In the current study, we found that the hyperlipidemic group had significantly higher MPV values. It has been known that larger platelets are biologically more active and have greater prothrombotic factors, therefore they represent an important risk factor for cardiovascular diseases [19]. Our data indicated that the hyperlipidemic group had significantly higher MPV, PDW, and P-LCR. This finding is consistent with the results of many previous studies [20-23]. The specific marker for platelet activation is PDW as it does not increase during simple platelet swelling. In our study, hyperlipidemic blood donors had significantly higher MPV, PDW, and P-LCR and there was also a significant correlation between PVI and the lipid profile. The platelets with hyperlipidemia can be more aggregable and reactive owing to increased PVIs. High levels of PVIs with hyperlipidemia can be a risk factor for atherosclerosis in adults. These indices can be used as early, cost-effective and identification of heart diseases and which can be more effective heart disease risk predictors than a single serum lipid value (e.g., Tchol, HDL, or LDL). Increased risk of atherosclerosis in adults with hyperlipidemia may be a result of high Platelet volume indices (PVIs). These indices may be used for early, cost-effective, and rapid identification of coronary risk factors as well as they also explain the pattern of platelet activation in the progression of hyperlipidemia and therefore should be included in the donor deferral criteria which can be used for deciding the exclusion criteria for donor selection. Thus it will help in making the patients safe as well as the donor deferral criteria more stringent to improve the quality of blood supply and will enable blood bankers to supply safe blood and improve the guidelines for blood safety.

DECLARATIONS

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Conflict of Interest

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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