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Study Of Platelet Indices In Type 2 Diabetes Mellitus And Associated Micro Vascular Complications

Dr. Y Sunayana[1], Dr. Prabhakar K[2], Dr. Anitha A[3]

[1]Post Graduate, Department of General Medicine, Sri Devaraj Urs Academy of Higher Education and Research, Tamaka, Kolar, Karnataka, India

[2]Professor, Department of General Medicine, Sri Devaraj Urs Academy of Higher Education and Research, Kolar, Tamaka, Kolar, Karnataka, India

[3]Professor, Department of General Medicine, Sri Devaraj Urs Academy of Higher Education and Research, Tamaka, Kolar, Karnataka, India

***Corresponding Author:**

Dr. Y Sunayana

Email ID: yellipalemsunayana@gmail.com

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ABSTRACT

Introduction: Diabetes, a serious long-term condition, is considered one of the great global health challenges of the twenty-first century. An estimated 463 million people had diabetes in 2019, and this is expected to reach 578 million by 2030 and 700 million by 2045.

The mean platelet volume (MPV) is an indicator of the average size and activity of platelets. Larger platelets are younger and exhibit more activity. The increased platelet activity may play a role in the development of vascular complications of this metabolic disorder.

Objectives:

1) To determine platelet indices in patients with type 2 diabetes mellitus.

2) To study association of platelet indices with microvascular complications in patients of type 2 diabetes mellitus.

materials and methods: A cross sectional study was undertaken in Department of Medicine of RL Jalappa Hospital, Sri Devaraj Urs Medical College, Tamaka, Kolar. A total of 30 cases were included in to the study and divided into 2 groups, one with diabetic and one without diabetic. HbA_{1c} values were conducted. A comprehensive blood count analysis, including the platelet indices (MPV, PDW, and P-LCR), was performed on the sample using a five-part differentiated automated hematology analyzer within two hours after venepuncture

Result: The present study consisted of 30 subjects divided into 2 groups of 15 each, cases (I) and controls (II). The average MPV in diabetics was 8.76 ± 1.25 fL as compared to the controls where it was 8.8 ± 0.96 fL with a statistically significant p-value of 0.001. PDW among the cases was12.18 ± 1.8 fL, while in controls, it was 11.82 ± 1.99 FL (p=0.001). The mean P-LCR was 32.35 ± 6.57 among the cases, in comparison to the mean P-LCR among the controls, which was 29.0 ± 5.79 (p=0.001). In this study, the MPV, PDW, and P-LCR were significantly raised in individuals having diabetes with microvascular complications when compared with patients without complications. The mean MPV in diabetics with complications was 8.84 ± 1.29 fL and in those without complications was 8.71 ± 1.05 fL (with a p-value of $P = 2\times10-3$) which is statistically significant. Similar results were obtained in cases of PDW and P LCR. The mean PDW in diabetics with complications was 12.46 ± 2.2 fL and without complications was 11.86 ± 1.51 fL ((with a p-value of $P = 2\times10-3$)). The mean P-LCR in diabetics with microvascular complications was 30.69 ± 5.17 and without complications was 31.6 ± 7.37

Conclusion: Based on the findings of the present study, there is a statistical correlation between type 2 diabetes and variations in platelet indices, resulting in the associated microvascular complications. Higher MPV, PDW, and P-LCR values suggest that these parameters are more reliable predictors of early vascular complications in individuals with type 2 diabetes mellitus and can be utilized as an easy-to-use, low-cost method. They are a readily available, economical, practical, noninvasive, and simple-to-understand approach for assessing platelet dysfunction, which in turn helps anticipate the existence of microvascular complications.

Keywords: *platelet indices , MPV, PDW, L PCR*

1. INTRODUCTION

Diabetes, a serious long-term condition, is considered one of the great global health challenges of the twenty-first century. An estimated 463 million people had diabetes in 2019, and this is expected to reach 578 million by 2030 and 700 million by 2045.[1]

The mean platelet volume (MPV) is an indicator of the average size and activity of platelets. Larger platelets are younger and exhibit more activity.[2] The increased platelet activity may play a role in the development of vascular complications of this metabolic disorder.[2] Platelet indices correlate with functional status of platelets and is an emerging risk factor of vascular complications in diabetes.[3] Platelet distribution width (PDW) is an indicator of variation in platelet size which may be a sign of active platelet release.[3]

Platelet activity and aggregation potential, which are essential components of thrombogenesis and atherosclerosis, can be conveniently estimated by measuring mean platelet volume (MPV).[4]

High MPV is emerging as a new risk factor for the vascular complications of DM of which atherothrombosis plays a major role.[5] Thus, DM has been considered as a "prothrombotic state" with increased platelet reactivity.

2. MATERIAL AND METHODS

Study period – may 2024 to July 2024

A cross sectional study was undertaken on patients with diabetes mellitus referred to Department of General Medicine at R.L. Jalappa Hospital and Research Center attached to SDUMC, Kolar. Clearance from institutional ethics committee was obtained before the study was started. An informed consent was obtained from all the cases before including them in to the study.

Sample size was estimated by using correlation coefficient (r) of MPV with Hba1c as 0.662 (i.e. r = 0.662) from the study by Brahmbhatt KJ et al. Using these values at 95% confidence level and 90% power and substituting in the below formula, sample size of 27 was obtained. Considering 10% Non-response rate a sample size of 27 + 2.7 = 30 subjects were included in the study.

Patients having hemoglobin levels < 13 gm% in men and 12 gm% in women. The study also excluded participants with a diagnosis of cancer and those taking antiplatelet medications like clopidogrel and aspirin. Following the baseline assessment, patients with diabetes were split into two groups based on their HbA_{1c} values: patients in group A had HbA_{1c} levels less than 6.5%, and patients in group B had HbA_{1c} levels greater than 6.5%. The American Diabetic Association's 2016 criteria were used to determine the most recent HbA1c cut-off for the diabetic range.

By figuring out the lowest value of these indices in diabetic situations, cutoff values for platelet indices have been determined. According to the proforma that was created, all of the subjects diabetic and non-diabetic were interviewed and had a thorough clinical evaluation, paying particular attention to any medications they may have taken and any related macro- or microvascular complications. To validate the diagnosis, pertinent tests such as blood glucose and HbA_{1c} values were conducted.

A comprehensive blood count analysis, including the platelet indices (MPV, PDW, and P-LCR), was performed on the sample using a five-part differentiated automated hematology analyzer within two hours after venepuncture. Appropriate statistical tests were conducted by using Statistical Package for social services.

3. RESULTS

		Frequency	Percent
Age group	**41 – 50 years**	2	6.7
	51 – 60 years	5	16.7
	61 – 70 years	16	53.3
	More than 70 years	7	23.3
Sex	**Male**	21	70.0
	Female	9	30.0
Duration of diabetes	**Less than 1 year**	3	10.0
	1 – 5 years	8	26.7

	5 – 10 years	10	33.3
	More than 10 years	9	30.0

HbA_{1c} grade	**Frequency**	**Percent**
Less than 6.5	33.3	33.3
≥ 6.5	20	66.7

Blood sugar levels	**Mean**	**SD**
Fasting blood sugar	154.2	38.96
Random blood sugar	185.7	56.6
Post prandial blood sugar	183.07	69.96

Platelet indices	**Mean**	**SD**
MPV	8.8	1.14
PDW	12.06	1.84
P-LCR	31.23	6.43

Platelet indices	**HbA_{1c} level**		**T value**	**P value, Sig**
	Less than 6.5% (Mean ± SD**)**	**≥ 6.5% (Mean** ± SD**)**		
MPV	8.8 ± 0.96	8.76 ± 1.25	0.11	0.991, NS
PDW	11.82 ± 1.99	12.18 ± 1.8	0.506	0.617, NS
P - LCR	29.0 ± 5.79	32.35 ± 6.57	1.366	0.183, NS

Platelet indices	**Complications**		**T value**	**P value, Sig**
	Less than 6.5% (Mean ± SD**)**	**≥ 6.5% (Mean** ± SD**)**		
MPV	8.71 ± 1.05	8.84 ± 1.29	0.296	0.770, NS
PDW	11.86 ± 1.51	12.46 ± 2.2	1.039	0.308, NS
P - LCR	31.6 ± 7.37	30.69 ± 5.17	0.397	0.694, NS

CONCLUSION – Our Study Shows , that there is a statistical correlation between type 2 diabetes and variations in platelet indices, resulting in the associated microvascular complications. Higher MPV, PDW, and P-LCR values suggest early vascular complications and are easy to use ,low cost method. We were also able to determine that platelet indices are a reliable indicator of the development of microvascular complications in type 2 diabetic individuals.

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