

CORRELATION BETWEEN MEAN PLATELET VOLUME AND DIABETIC RETINOPATHY IN PATIENTS OF DIABETES MELLITUS TYPE II

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Abstract

Background: Purpose is to determine correlation between Mean Platelet volume (MPV) and diabetic retinopathy (DR) in patients of diabetes mellitus Type II. Diabetic retinopathy is a type of micro vascular lesion, which is detected on fundus examination. It is found in 16.9% of population over 50 years of age.^[1] **Materials and Methods:** It is a hospital based retrospective study. All the patients who came for fundus examination during the period 1 April 2019 to 31 March 2020 & diabetic retinopathy was detected were shortlisted for this study. Out of these, patients whose age was more than 40 & whose data of complete blood count was available were selected for this study. For controls, equal number of patients during the same period and in the same age group whose blood sugar was in normal range were selected as control. **Result:** MPV in diabetics with DR was found to be 11.7+1.4 whereas in control group, it was 9.6+0.4. **Conclusion:** MPV was found to be raised in diabetics with diabetic retinopathy as compared to normal population.

INTRODUCTION

Diabetes Mellitus (DM) is a major global health disease. There are more than 422 million known diabetes in the world as estimated by WHO in 2014.^[2] For every known diabetic, there is one undiagnosed diabetic also.^[3] It is one of the main case of impaired vision even blindness. There is increased risk of micro & macro vascular diseases in the diabetic patients thus leading to diabetic retinopathy. It is found in more than 40% of diabetics of more than 40 years of age and with more than 5 years history of diabetes. Altered morphology of platelets is a causative factor for such vascular diseases.^[4,5] Platelet volume, measured as mean platelet volume is a marker of platelet activation & function. Normal reference range for MPV is 7.5-11.5 fL.^[6] Larger platelets are younger and exhibit more activity. Altered platelet morphology and function has been observed in diabetes in the form of increased platelet activity leading to this prothrombotic state.^[7]

MATERIALS AND METHODS

This is a retrospective analytical study done in a NABH accredited hospital and NABL accredited lab in north India.

Inclusion Criteria: Diabetic patients who came for fundus examination, were diagnosed as Diabetic Retinopathy and who underwent complete blood count (CBC) and Random Blood Sugar (RBS) during the period 1 April 2019 to 31 March 2020. Fundus examination was done by Vitreo-retinal surgeon with indirect Ophthalmoscope using 20D lens & findings were recorded.

Exclusion Criteria: Patients with abnormal platelet count (not between 1.5- 4.00) were excluded.

Patients who were taking blood thinners or drugs that affect platelet function such as (Aspirin, Heparin, Ticlopidine, Warfarin) were also excluded.

Method: For control, equal number of patients during the same period and in the same age group whose RBS was in normal range i.e. up to 140 mg/dL and CBC report was available were selected. Sample for CBC was taken in K2EDTA filled vacutainer & run on Sysmex XP 100 3-part automatic cell counter (made in Japan). RBS was done from fluoride sample and run on biochemistry analyser Erbachem (made in India) 7 by glucose oxidase-peroxidase method.

Data was collected and analysed using Microsoft excel. Variables are presented as mean + Standard deviation. As this study was retrospective and based on data collected for clinical purpose, without revealing the identity of the persons, thus no ethical issues are involved.

RESULTS

During the study period 1 April 2019 to 31 March 2020, 124 patients were identified who met the inclusion and exclusion criteria. Equal number of patients with same age group and whose random blood sugar and CBC reports were available were shortlisted as controls.

Table 1 describes the demographic details of the patients selected for the study and the individuals in the control group.

Age varied from 40 to 80 years. In the diabetics group, maximum patients 43(34.7%) were in the age group 50-59, followed by age group 60-69 i.e. 34 (27.4%).

In the diabetics group, the mean age of the participants was 58.1 years with SD + 10.0. In the control group, the mean age was 53.5 years with SD +10.5 years.

Table 1: Demographic Details: Age wise

Age wise	Diabetics	%	Control	%
40-49	24	19.4	54	43.5
50-59	43	34.7	32	25.8
60-69	34	27.4	24	19.4
70-79	17	13.7	14	11.3
80-89	6	4.8	0	0.0
Total	124		124	
Mean	58.1		53.5	
SD	10.0		10.5	

[Table 2] describes the sex wise distribution. Out of 124, 88 (71%) of the diabetic patients were male as compared to 84 (67.7%) in the control group.

Table 2: Demographic Details: Sex wise

Sex wise	Diabetics	%	Control	%
Males	88	71.0	84	67.7
Females	36	29.0	40	32.3
Total	124		124	

As seen in table 3, the mean platelet volume of the diabetic group varied from 10.1 to 14.4 with a mean of 11.7 with standard deviation of + 1.4. In the control group, MPV varied from 8.4 to 10.0 with a mean of 9.6 + 0.4.

Table 3: Mean Platelet Volume

	Diabetics	Control
Min	10.1	8.4
Max	14.4	10
Mean	11.7	9.6
SD	1.4	0.4

As evident in table 4, RBS level in diabetic group varied from 60 to 298 mg/dl with mean value of 116.3 and standard deviation + 44.4. While in the control group, it varied from 72 to 140 with mean of 97.2 and standard deviation of 17.2.

Table 4: Random Blood Sugar

	Diabetics	Control
Min	60	72
Max	298	140
Mean	116.3	97.2
SD	44.4	17.2

As shown in table 5, mild Non Proliferative Diabetic Retinopathy (NPDR) was seen in 69(55.6%) cases, moderate NPDR in 35 (28.2%) cases, severe NPDR in 15 (12%) and Proliferative Diabetic Retinopathy (PDR) in 5 (4%). MPV was 10.8+0.47 in cases with mild NPDR, 12.17+ 0.28 in moderate NPDR, 13.1 +0.38 in severe NPDR cases and 16.4 + 2.58 in PDR cases.

Table 5: Grades of diabetic retinopathy with mean platelet volume

Grade	Percentage of Cases	MPV
Mild NPDR	69 (55.6%)	10.8+0.47
Moderate NPDR	35 (28.2%)	12.17+ 0.28
Severe NPDR	15 (12%)	13.1 +0.38
Proliferative DR	5 (4%)	16.4 +- 2.58

DISCUSSION

Mean Platelet Volume (MPV) is an emerging risk factor identified for development of atherosclerosis and other systemic diseases in patients of diabetes mellitus. Cheng et al. has shown the role of mean platelet volume as a predicting factor of asymptomatic coronary artery disease.^[8] Targutalp K has shown the role of MPV as risk factors in cases of diabetic nephropathy. We have found significant difference in the MPV in the diabetics with signs of diabetic retinopathy.^[9] as compared to normal population. In our study, the MPV was 11.7+-1.4 in patients suffering from diabetic retinopathy as compared to 9.4+-0.4 in the normal population taken as control. This finding is similar to the observation of Yeruva Poulina Deepthi Reddy,^[10] and Dolasik et al.^[11] As the diabetic patients were on treatment, thus the levels of RBS were not considered as important and correlated with the values of MPV. Meta-analysis by Ji S, Zhang J, Fan X, Wang X, Ning X, Zhang B, Shi H, Yan H demonstrated that increased MPV level was significant associated with the development of DR, and it might reflect the severity of DR, which could be provided to monitor development and progression of DR clinically.^[12] Further, the severity of the DR was directly proportional to the MPV value. As evident in the table 5, patients with Mild DR had the MPV 10.8+-0.47. In cases with moderate DR, this figure of MPV raised to 12.17+ 0.28. In severe NPDR & PDR cases, this figure was 13.1 +0.38 and 16.4 + 2.58 respectively. As shown, values of MPV keeps on increasing with increase in severity of diabetic retinopathy. Similar co relation was also reported by Yeruva Poulina Deepthi Reddy.^[10] MPV is directly related with the adhesion & aggregation of the platelets. Higher the MPV volume, higher is the function and activity of platelets. Shah B has reported that MPV was strongly associated with the severity of cardio vascular complications in diabetics.^[13] The larger the MPV, the more likely formation of thrombosis, and in other hand, vascular endothelial injury triggers platelet adhesion and aggregation to accelerate thrombosis. DR grade resulted in the heterogeneity and the MPV level was also upregulated in higher DR grades as in study conducted by Papanas et al.^[11]

CONCLUSION

Mean platelet volume was reported to be raised in diabetic retinopathy patients particularly in those having uncontrolled blood sugars. We recommend

that MPV can be used as a simple and cost-effective tool to monitor the progression of the diabetic retinopathy. So, in future, while testing for RBS or lipid profile, we should also consider testing diabetic patients for MPV also.

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Conflict of Interest

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REFERENCES

1. Vashist, Praveen; Senjam, Suraj S; Gupta, Vivek; Manna, Souvik; Gupta, Noopur; Shamanna, B R1; Bhardwaj, Amit; Kumar, Atul; Gupta, Promila2. Prevalence of diabetic retinopathy in India: Results from the National Survey 2015-19. *Indian Journal of Ophthalmology* 69(11):p 3087-3094, November 2021. | DOI: 10.4103/ijo.IJO_1310_21
2. <https://www.WHO.int/news-room/fact-sheets/detail/diabetes>
3. [https://IDF.org/aboutdiabetes/what-is-diabetes/facts-figures.html#:~:text=Almost%201%20in%202%20\(240,living%20with%20type%201%20diabetes](https://IDF.org/aboutdiabetes/what-is-diabetes/facts-figures.html#:~:text=Almost%201%20in%202%20(240,living%20with%20type%201%20diabetes)
4. Ji S, Zhang J, Fan X. The relationship between mean platelet volume and diabetic retinopathy. *Diabetol Metab Syndr.* 2019;11:25.
5. Sertbas Y, Sertbas M, Okuroglu N, Ozturk MA, Abacar KY, Ozdemir A. Mean platelet volume changes before and after glycated hemoglobin (HbA1c) improvement in a large study population. *Arch Med Sci.* 2017;13(4):711-5.
6. Schmoeller D, Picarelli MM, Paz Munhoz T, Poli de Figueiredo CE and Staub HL (2017) Mean Platelet Volume and Immature Platelet Fraction in Autoimmune Disorders. *Front. Med.* 4:146. doi: 10.3389/fmed.2017.00146
7. Turgutalp K, Ozhan O, Akbay E, Tombak A, Tiftik N, Ozcan T, et al. Mean platelet volume and related factors in patients at different stages of diabetic nephropathy: a preliminary study. *Appl Thromb Hemost.* 2014;20:190-5.
8. Cheng H, Huang HS, Park HK, Chun MY and Sung JY. The role of mean platelet volume as a predicting factor of asymptomatic coronary artery disease. *Korean J Fam Med.* 2010;8:600-6.
9. Targutalp K, Ozhan O, Akbay E, Tiftik N, Yilmaz S, Kiykim A. Mean platelet volume and related factors in patients at different stages of diabetic nephropathy. *Nephro Dial Transplant.* 2012;27(2):167-77.
10. Reddy YPD, Vithiavathi S, Kalaiselvi G. A study of the correlation between mean platelet volume and diabetic retinopathy in patients with type 2 diabetes mellitus. *Panacea J Med Sci.* 2020;10(1):10-2.
11. Dolasik I, Sener SY, Celebi K, Aydin ZM, Korkmaz U, Canturk Z. The effect of metformin on mean platelet volume in diabetic patients. *Platelets.* 2012;4.
12. Ji S, Zhang J, Fan X, Wang X, Ning X, Zhang B, Shi H, Yan H. The relationship between mean platelet volume and diabetic retinopathy: a systematic review and meta-analysis. *Diabetol Metab Syndr.* 2019 Mar 12;11:25. doi: 10.1186/s13098-019-0420-3. PMID: 30911336; PMCID: PMC6417244.
13. Shah B, Sha D, Xie D, Mohler ER, Berger JS. The relationship between diabetes, metabolic syndrome, and platelet activity as measured by mean platelet volume: the national health and nutrition examination survey, 1999-2004. *Diabetes Care.* 2012;35:1074-8