ORIGINAL ARTICLE

Mean Platelets Volume as Risk Predictor of Stroke among Diabetics: Cross Sectional Study

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ABSTRACT

Essential mediators of coagulation, inflammation, thrombosis, and atherosclerosis are secreted by platelets.
Aim: To evaluate frequency of mean platelet volume among diabetics presenting with cerebro-vascular accidents.
Study Design: Cross-sectional study.
Methodology: Patients (n=137) having type-2 diabetes were enrolled to conduct the present study at Department of Medicine Khyber Teaching Hospital, Peshawar-Pakistan for 6 months keeping data confidential. 10cc blood from all the patients, was obtained under strict aseptic conditions and was immediately sent to hospital laboratory for measurement of MPV. Enrolled patients were informed and consent was taken. Mean+SD was used for variables like age and MPV and duration of disease. Frequencies and percentages were given for variables like gender.
Results: The mean age of patients was 53.01±11.97 years. Enrolled patients include 85(62.04%) females and 52(37.96%) males. The average MPV was observed 9.42±0.92 fl.
Conclusion: This study showed that MPV as an independent risk indicator for stroke among patients having prior cerebro-vascular disease.
Keywords: Frequency, Platelet Count, Diabetics and Cerebro-vascular.

INTRODUCTION

Platelets play vital role in pathogenesis of ischemic events as revealed by literature review.. Large platelets are hastier as they secret more pro-thrombotic factors that show larger collection of adenosine di-phosphate (ADP), collagen or adrenaline and produce more thromboxaneA2. Patients having diseases like diabetes mellitus, hypercholesterolemia, myocardial infarction, ischemic stroke and smoking have enlarged platelets[1].

Essential mediators of coagulation, inflammation, thrombosis, and atherosclerosis are secreted by platelets. The role of anti-platelet drugs in-order to decrease cardiovascular events has favoured the role of platelets in the athero-thrombotic process[2]. Increased average volume of platelets is a basis of coronary heart disease pathologically. Resistance to insulin activates more platelet.[3] Among diabetic patients risk of micro-vascular complications and thrombotic events are predicted by mean platelet volume (MPV) and platelets counts[4,5].

Granulated large platelets are more active metabolically and enzymatic ally as they own more thrombotic activity; linking increased MPV with increased thrombotic potential as reported in literature[6,7]. Literature review showed that a positive correlation was found between MPV and platelet distribution width in diabetic patients having significant p-value. In this study, the mean MPV between patients with DM and healthy controls was 9.21±0.14 and 8.535±0.166 respectively[5]. Another study showed that higher MPV was found among type II diabetics or having its micro or macro vascular complications. In their study, MPV was significantly higher among diabetics than healthy controls[7].

There is higher chance of type-2 diabetes causing cerebro-vascular diseases among our Pakistani population but limited data is available regarding this health issue due to limited resources. Thus, we planned the current study to evaluate frequency of MPV among diabetics presenting with cerebro-vascular accidents**.**

The objective of the study was to evaluate frequency of mean platelet volume among diabetics presenting with cerebrovascular accidents.

METHODOLOGY

Patient (n=137) having type-2 diabetes was enrolled to conduct the present study at Department of Medicine Khyber Teaching Hospital, Peshawar-Pakistan for 6 months keeping data confidential after Hospital's Ethical Committee approval.10cc blood was obtained under strict aseptic conditions from the patients and was immediately sent to hospital's laboratory for evaluating MPV. Enrolled patients were informed and consent was taken. Both genders having type-2 diabetes with cerebro-vascular were included in conducted study. Patients who failed to give informed consent, having Chronic kidney and liver diseases and pregnant females were excluded.
Statistical analysis: Mean+SD was used for variables like age and MPV and duration of disease. Frequencies and percentages were given for variables like gender. MPV was stratified among age given by SPSS version 20 to see the effect modifiers.

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RESULTS

Among 137 enrolled patients, demographic parameters were summarized in table-1. Out of 137 diabetic patients with cerebrovascular disease, majority 84(61.3%) had MPV greater than 9.01fl. Majority of patients 65(47.45%) had duration of disease below four years as shown in table-2. Age wise distribution of MPV showed that MPV in old age got high in comparison to younger age in table-3.

Table-1: Demographic Parameters Presented as Frequency & Percentage

Age (Years)	Frequency	%age
Below 40	26	19.0
41-50	39	28.5
51- 60	30	21.9
Above 60	42	30.7
Mean±SD	**53.01±11.97 years**	
Gender distribution		
Male	52	37.96
Female	85	62.04
Total	**137**	**100**

Table-2: Duration of Diabetes and Mean Platelet Volume as Mean±SD

Duration of D.M (Years)	Frequency	%age
Below 4	65	47.45
5-7	42	30.66
8- 10	24	17.52
Above 10	6	4.38%
Mean±SD	**5.15±2.87 years**	
MPV (fl)		
Below 9.00	53	38.7
Above 9.01	84	61.3
Mean±SD	**9.42±0.92 fl**	
Total	**137**	**100**

Table-3: Stratification Of MPV Among Age Groups

Age (Years)	Mean platelet volume (in fl)		Total
	Below 9.00	Above 9.00	
Below 40	15 (57.7%)	11 (42.3%)	26(100%)
41-50	22 (56.4%)	17 (43.6%)	39(100%)
51- 60	9 (30%)	21 (70%)	30(100%)
Above 60	7 (16.7%)	35 (83.3%)	42(100%)
Total	53 (38.7%)	84 (61.3%)	137(100%)

DISCUSSION

Major health issue around the globe is Diabetes mellitus (DM)[8,9]. World Health Organisation, reported that almost 346 million people suffered from diabetes globally in 2011[10]. Increased platelet activity predicted that platelets play an important role in the progression of vascular complications due to diabetes[11].

Their average sizes and activity levels are indicated by MPV. Larger platelets are more reactive and agreeable. They are densely granulated and are the source of more serotonin, β-thrombo-globulin and thromboxaneA2 than smaller platelets[12,13]. All these can contribute in a pro-coagulant effect and cause thrombotic vascular complications. This correlates between the platelet function especially MPV and diabetic vascular complications thus indicating changes in MPV reflect the state of thrombogenesis[12,14].

Present study is unique is a sense that it showed a positive relationship between MPV and risk of stroke. Study showed that this relation was independent of other established determinants and primarily linked with ischemic stroke. This association is due to greater reactivity of larger platelets[15,16]. Literature review showed the positive effects of anti-platelet therapy on decreasing the risk of ischemic stroke[17].

Manual errors can cause faulty measurement of MPV thus uncertainty MPV with coronary events and cripple the strength of the association of MPV with stroke.[17] It has been documented that they swell in a time-dependent fashion after blood sampling in EDTA tubes[18,19]. To conduct assays after 24-48 hrs (platelets stop swelling) of blood collection was an effort to minimize errors[19]. Its impossible to adjust for the differences due to effects of platelet swelling on MPV measurements because it was not possible to calibrate the time dependent curve of all the 5 machines which were used to measure MPV. However, no clue of heterogenicity was found for the analysis of the effect of time in sample collection and analysis in association of MPV and stroke. There is small antiplatelet effects of perindopril and other angiotensin-converting Enzyme (ACE) inhibitors[20]. No evidence was found in this study on an effect of the randomized treatment on subsequent platelet parameters.

Limitations: Our study had several limitations like financial constraints, time restrictions, small sample number and fewer resources.

CONCLUSION

This study showed that MPV as an independent risk indicator for stroke among patients having prior cerebro-vascular disease. The knowledge of MPV may add useful diagnostic information for doctors handling patients with a record of cerebro-vascular disease in diabetic patients.

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REFERENCES

1. Dogan NO, Keles A, Demircan A, Bildik F, Kilicaslan I, Ilhan M et al. Mean platelet volume as a risk stratification tool in the Emergency Department for evaluating patients with ischaemic stroke and TIA. JPMI. 2013;62(5):581-4.
2. Chu SG, Becker RC, Berger PB, Bhatt DL, Eikelboom JW, Konkle B et al. Mean platelet volume as a predictor of cardiovascular risk: a systematic review and meta-analysis. Thrombosis Haemostasis. 2013;8(1):148-56.
3. Elsherbiny IA, Shoukry A, El Tahlawi MA. Mean platelet volume and its relation to insulin resistance in non-diabetic patients with slow coronary flow. Cardiol. 2012;59(2):176-81.
4. Akinsegun A, Olusola AD, Sarah J, Olajumoke O, Adewumi A, Majeed O et al. Mean platelet volume and platelet counts in type 2 Diabetes: Mellitus on treatment and non-diabetic mellitus controls in Lagos, Nigeria.Pan Med. 2014;18:42

5. Jabeen F, Fawwad A, Rizvi HF, Alvi F. Role of platelet indices, glycemic control and hs-CRP in pathogenesis of vascularcomplications in type-2 diabetic patients. Pak J Med Sci. 2013;29(1):152-6.
6. Jindal S, Gupta S, Gupta R. Platelet indices in diabetes mellitus: indicators of diabetic microvascular complications. Hematol. 2011;16:86-9.
7. Yenigün EC, Okyay GU, Pirpir A, Hondur A, Yıldırım S. Increased mean platelet volume in type 2 diabetes mellitus. Dicle Med J. 2014;41(1):17-22.
8. Mahsud MAJ, Khan A, Hussain J. Hematological Changes in Tobacco using Type 2 Diabetic Patients. Gomal J Med Sci. 2010;8:8-11.
9. King H, Aubert RE, Herman WH. Global burden of diabetes, 1995-2025: prevalence, numerical estimates, and projections. Diabetes Care. 1998;21:1414-31.
10. World Health Organization August 2011. [Last accessed on 2011 Nov 17]. Available from: http://www.who.int/mediacentre/factsheets/fs312/en/.
11. Demirtunc R, Duman D, Basar M, Bilgi M, Teomete M, Garip T. The relationship between glycemic control and platelet activity in type 2 diabetes mellitus. J Diabetes Complications. 2009;23:89-94.
12. Hekimsoy Z, Payzinb B, Ornek T, Kandogan G. Mean platelet volume in Type 2 diabetic patients. J Diabetes Complications. 2004;18:173-6.
13. Chang HA, Hwang HS, Park HK, Chun MY, Sung JY. The Role of Mean Platelet Volume as a Predicting Factor of Asymptomatic Coronary Artery Disease. Korean J Fam Med. 2010;31:600-6.
14. Bae SH, Lee J, Roh KH, Kim J. Platelet activation in patients with diabetic retinopathy. Korean J Ophthalmol. 2003;17:140-4.
15. Butterworth R, Bath P. The relationship between mean platelet volume, stroke subtype and clinical outcome. Platelets. 1998;9:359–364.
16. Bath P, Butterworth R. Platelet size: measurement, physiology and vascular disease. Blood Coagul Fibrinolysis. 1996;7:157–161.
17. Blood Pressure Lowering Treatment Trialists' Collaboration. Effects of ACE inhibitors, calcium antagonists and other blood pressure lowering drugs: results of prospectively designed overviews of randomised trials. Lancet. 2000;356:1955–64
18. Staines A,Hanif S,Ahmed S, Incidence of insulin dependent diabetes mellitus in Karachi, Pakistan. Arch Dis Child. 1997;76:121-3.
19. Wild S,Roglic G,Green A.Global Prevalence of diabetes: estimates for the year 2000 and projection for 2030. Diab Care. 2004;27(5):1047-53.
20. Shera AS, Rafique G, Khuwaja IA. Pakistan National Diabetes Survey. Prevalence of glucose intolerance and associated factors in North West Frontier Province (NWFP) of Pakistan. J Pak Med Assoc. 1999;49(9):206-11.