ASSESSMENT OF THE COAGULATION STATUS OF THE DIABETIC PATIENTS AS COMPARED TO NORMAL SUBJECTS

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Abstract

Background: Many vascular complications are seen in the diabetes mellitus these complications can be corelated with the increased platelet activity. Increased platelet activity can be recognized by the mean platelet volume. This study is conducted to evaluate the relationship of increased platelet volume and the diabetes mellitus.

Materials and Methods: The study was carried in recognized medical institution on 300 subjects 150 with type 2 diabetes mellitus and 150 age matched non diabetics.

Results: the results showed that there is increased platelet activity (MPV 12.03 + 1.67 vs. 6.92 + 0.91fl, P0.001) in diabetic patients as compared to normal subjects.

Conclusion: Early detection of increased platelet activity will be helpful in early detection of coagulation status and vascular complications in diabetics.

Keywords: Diabetes, Coagulation status

Introduction

Mean platelet volume is the indicator for the increased platelet activity can be easily measured by haematological analyzer.(**1**) It is also a known fact that the type 2 Diabetes mellitus experience increased coagulating activity, thrombus formation along with micro-vascular and macro-vascular problems.**2** large activated platelets releases greater quantities of serotonin and thromboxane.**3** Metabolic disorders like diabetes mellitus and insulin resistance causes excessive platelet activation, this results in excessive release of serotonin and thromboxane A2 and platelet adhesion to the vascular endothelium. Damage to vascular endothelium, reduced sensitivity of the platelets to nitric oxide and increased synthesis of von Willebrand also add to this adhesion and thrombus formation that is high coagulating tendencies.**4** This explains why platelet activity and vascular endothelial damage in diabetes patients are interrelated and goes hand to hand with the disease progression.

4 In present study we measure the platelet activation with help of the mean platelet volume in the diabetes patients and compared with the diabetic patients to assess the association of vascular problems in diabetes mellitus.

Material and methods

The ethical committee permission was taken from the institution. The subjects for the study were recruited from the OPD and IPD of the hospital. The study was explained to the subjects and a written consent was received from the patients. After that the subject were divided into two groups first known cases of type 2 Diabetes Mellitus and second group of Age and Sex

matched controls. Patients who were receiving anticoagulant medications and good glycaemic control were not included in our study.

All the subjects were investigated for the HbA1C, and Complete Blood Count including mean platelet volume. Patients with HbA1C more than 7 % are labelled as diabetics. **5** controls were the age matched subjects from hospital OPD and IPD with HbA1C less than 6%. Tacking in consideration 0.5 % analytical errors. A detailed history and examination was carried out for the controls and patients. After that under all aseptic precautions, blood sample was taken from the patients and subjects and collected in EDTA vacutainer and HbA1C and mean platelet volume was measured. All the tests were performed within a few hours of the sample collection.

Statistical analysis:
The sample size of this study was determined by considering mean palate volume as primary outcome. The sample size of 300 (150 for each group) subjects was determined for effect size of 0.23 at 95% confidence level and 80% power. All data was summarised in form of frequency, percentage, descriptive statistics and represent in bar diagram. The Shapiro Wilk test was used to examine Gaussian distribution of platelet volume and to student's t- test was used to compare the mean platelet volume between two groups. The P-value less than 0.05 was considered as statistically significant.

Results:

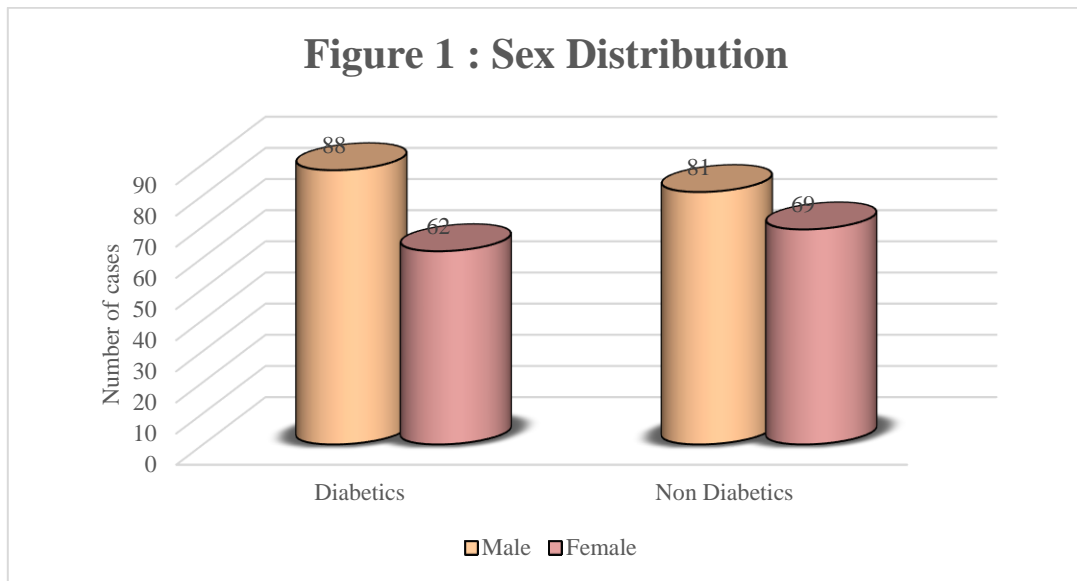| Table 1: Sex distribution				
Gender	Diabetics		Non-Diabetics	
	Number of cases (n)	Percentage (%)	Number of cases (n)	Percentage (%)
Male	88	58.67	81	54
Female	62	40.67	69	46
Total	150	100	150	100

Figure 1 : Sex Distribution

Table 1 and figure 1 shows the sex distribution of study subjects. The sex distribution of the participants was uneven in both groups, in diabetics group there was 88(58.67%) males & 62 (40.67%) females while in non-diabetics group there was 81(54%) males & 69(46%) females. The proportion of male and female in both groups was comparable.

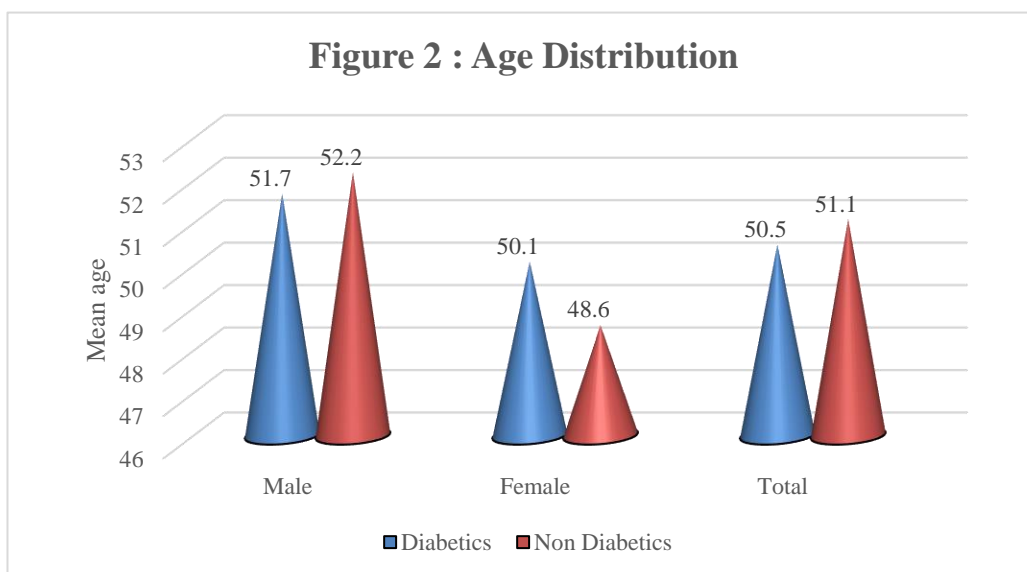| Table 2: Age distribution					
Gender	Diabetics		Non-Diabetics		P-value
	Mean	SD	Mean	SD	
Male	51.7	2.6	52.2	2.9	0.1170
Female	50.1	2.8	48.6	3	0.0001*
Total	50.5	2.9	51.1	3	0.0792
SD: Standard Deviation, *: Significant					

Figure 2 : Age Distribution

Table 1 and figure 1 shows the age distribution of study subjects. The mean age of cases in and non-diabetics groups was 50.5±2.9 and 51.1±3 respectively. The difference of mean age of cases between diabetics and non-diabetics was statistically insignificant (P=0.0792).

Table 3: Comparison of Mean Palate Volume					
Gender	Diabetics		Non-Diabetics		P- value
	Mean	SD	Mean	SD	
Male	12.18	1.91	7.2	0.78	0.0001*
Female	11.67	1.58	7.3	1.05	0.0001*
Total	12.03	1.67	6.92	0.91	0.0001*
SD: Standard Deviation, *: Significant					

Figure 3: Comparison of Mean Platelet Volume
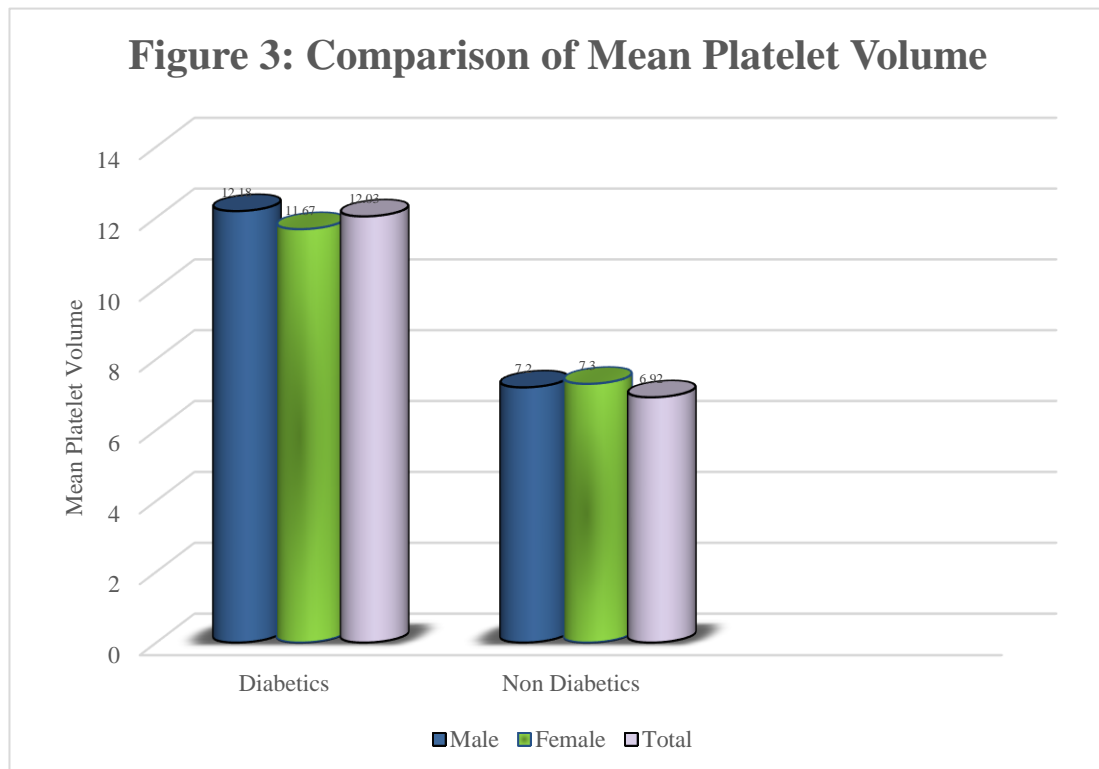
The mean platelet volume of diabetic's patients for males (P=0.0001) as well as females (P=0.0001) was significantly higher as compared to non-diabetic's patients. The mean platelet volume in overall diabetic patients was significantly increased (P=0.0001) as compared to non-diabetic's patients.

Discussion

Diabetes is a condition where there is rise in blood sugar level which is associated with metabolic dysregulation.**6** Many different mechanisms are described to explain the basic pathology of the diabetes mellitus is related with hyper-coagulation status and development of macro and micro vascular abnormalities. These abnormalities could be due to reduced nitric

oxide production which is a vasodilator and increased production of vasoconstrictor agents like endothelin -1from the damaged endothelium. Metabolic changes in diabetes mellitus also activates some genes which plays role in activating the mediators of atherogenesis. Also there is formation of unstable plaque because of the decreased collagen formation in diabetes mellitus. The changed or enhanced platelet functions also plays important role in the promoting the process of thrombus formation.[7] Generally the presence of insulin platelet and collagen interaction and prevent the thrombus formation. In type 2 diabetes mellitus there is receptor level insulin resistance this causes increased thrombotic activity in the patients of diabetes mellitus which leads to many vascular complications.[8] The mean volume of platelets of platelet helps in measuring the mean aggregating activity of the platelet thus it measures the thrombotic activity of the platelet[3]

In our study when mean platelet volume of diabetic was compared with non -diabetic it showed significant increase ((MPV 12.03 + 1.67 vs. 6.92 + 0.91fl) that is p-value less than 0.001. Similar findings were there in many previous studies.[3, 6, 9, 10, 11.] Hyperglycemia causes reduction in the membrane fluidity and increased in the platelet volume and activity of platelets by glycating the proteins on the surface of platelets.

Long lasting increased glucose level causes increased glycation of the platelets and formation of Glycogen inside platelet and that results in the increased in mean platelet volume.[12] There are few studies[9] in which mean MPV in diabetic patients was not altered significantly in diabetics as compared to non-diabetic controls. contradicting our findings. Similar findings were also seen in a majority of studies carried out.[10, 13, 14], This suggests that, in the development of vascular complications, a higher activity of platelets plays an important role. Due to the increased production of thromboxane A2 resulting from procoagulant effects that lead to thrombotic vascular complications, larger platelets are hyperactivity and more aggregable than smaller platelets.[4] This was in contrast with a few studies[3, 11] in which no significant difference was observed in MPV between patients with diabetic complications and without complications. One study also showed that with better glycaemic index there is improvement or reduction in the MPV.[15] This indicates the importance of glycaemic control in platelet reactivity. Nevertheless, a small number of studies[16] found no connection between glycaemic variables and MPV.

Conclusion

Our study shows that there is increased mean platelet volume in the patients with diabetes mellitus with poor glycaemic control. This is resulting in the increased thrombotic activity in these patients. The increased thrombotic activity is associated with hypercoagulable status and associated many micro and macro vascular abnormalities. Thus, the cause of the vascular abnormalities in the patients of the diabetes mellitus could be the increased platelet activity that can be measured with the increased mean platelet volume.

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