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ROLE OF MEAN PLATELETS VOLUME IN NON INSULIN DEPENDENT DIABETES MELLITUS (NIDDM)

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ABSTRACT

Background: Platelets with altered morphology or large size are more thrombogenic and are likely to be associated with increased risk of vascular disease. Platelet parameters especially high mean platelet volume (MPV) has been reported in diabetic patients as major contributing factor. **Aim of the study:** To determine if platelets were activated in diabetes by measuring the MPV in the diabetics compared to the non diabetics, to see if MPV was influenced in relation HbA1c and total platelet count. **Materials and Methods:** In the present study 100 were analyzed rand categorized into two groups based on the fasting blood glucose levels as Group I - healthy (non diabetics n= 40) Group II (patients with diabetic mellitus type II n=60), **Results:** MPV values were 8.97 ± 1.28 fl in diabetic individuals whereas 9.14 ± 1.01 in controls. The mean of total platelet counts in group II and group I were 233.79±85.7 x 10^9/l and 291.78 ± 97.81, respectively which were statistically significant different, platelets count was lower in uncontrolled diabetics and MPV larger than controlled diabetics. **Conclusions:** platelets count decrease in diabetics, MPV was larger in uncontrolled diabetics, the parameters still showed progressive decrease and increase with rising sugar levels significant in diabetic group.

INTRODUCTION

Diabetes mellitus (DM) is a major global health problem.[1] it refers to a group of common metabolic disorders that share a phenotype of hyperglycemia.[2] Diabetic patients have an increased risk of developing micro- and macro vascular disease, and platelets may be involved as a causative agent with respect to altered platelet morphology and function.

Platelets play a major role in maintaining normal hemostasis.[3] Increased activation of platelets has been implicated in the pathogenesis of vascular complications.

The increased platelet activity is emphasized to play a role in the development of vascular complications of this metabolic disorder.[4] Platelet volume, a marker of the platelet function and activation, is measured as mean platelet volume (MPV) by hematology analyzers.

The MPV is measured as the part of the complete blood count. Under normal circumstances larger platelets are younger and exhibit more activity. Higher levels of MPV are encountered in conditions with increased production in response to increased destruction of platelets such as immune thrombocytopenic purpura. Large platelets contain more dense granules and produce large amounts of thromboxane A2. Thus, platelets exhibit hyper-responsiveness to ADP- or collagen-induced aggregation.[5] Various studies reported that increased levels of MPV is an independent risk factor for arterial thrombotic events such as myocardial infarction and cerebral thromboembolism.[6] The patients with diabetes mellitus are at increased risk of macro vascular and micro vascular complications. Particularly the incidence of arterial complications (coronary artery disease, cerebro vascular events) is higher compared to normal population.

AIM OF THE STUDY

To determine if platelets were activated in diabetes type II by measuring the MPV in the diabetics compared to the non diabetics, to see if MPV was influenced in relation HbA1c total platelet count.

MATERIALS AND METHOD

Study design: A case control study was designed evaluate mean platelets volume in diabetics and compare with healthy non diabetics.

Ethical approval: Approval was granted from the Research and Ethics Committee of the collage. Consent was gotten from all participated patients**.**

Patients study

The study was conducted in alwahda hospital, and from clinic of diabetic. The study included 60 diabetic patients

and 40 non diabetics (as control) without coronary artery disease (CAD).

All the diabetic and non diabetic subjects underwent complete clinical evaluation with specific reference to any micro- and macro-vascular complications.

Sixty patients with mean of age 51.79 ± 16 years, 25 was female and 35 was male and forty was healthy non diabetic) as control with mean of age 39.07 ± 15.75 years.

Samples collection

Venous blood samples were analyzed from both the groups for complete blood count, FBS, and HbA1c. Under aseptic conditions, 2 ml of venous blood was collected in EDTA vials for complete blood counts and HbA1c. The FBS was analyzed in samples collected in sodium fluoride. Early morning samples were drawn for estimating fasting blood glucose levels. Samples were maintained at room temperature and analyzed within one hour of collection. MPV and platelet counts were analyzed in fully automated hematology analyzer BC-3000 plus.

Blood glucose levels were tested using automated biochemistry analyzer. and that of HbA1c by the high-performance liquid chromatography method.

Patients were divided into two groups according to the HbA1c level. Subjects with an HbA1c lower than 7 were classified as well-controlled, and equal to or greater than 7 were classified as poorly controlled diabetics.

Statistical analysis

All the continuous variables were presented as Mean ± SD. The comparison between two variables was done with the help of students T test. P value of less than 0.05 is considered to be statistically significant.

RESULT

In this study, samples from 60 diabetics and 40 healthy controls were analyzed for MPV, platelet counts, HbA1c, and FBS. There were 35 males and 25 females in diabetic individuals. In control group (healthy, non diabetics) 19 males and 21 females were included. Samples of varying ages with a minimum age of 30 years and maximum age of 80 years were included in the present study. The various parameters were compared in diabetics and healthy controls. The mean age in diabetics was 51.79 ± 16.18 years when compared to 39.07±15.75 years in healthy controls as shown in Table 1.

The mean FBS levels were 168.79±88.72 in diabetics while 91.78 ± 17.5 mg/dl in controls there was statistical significant difference between FBS in controlled diabetics and uncontrolled according to HBA1C P= 0.001, The mean HbA1c were higher in tests (8.27 ± 2.36) than the controls (4.36 ± 0.509). We noticed a strong statistical difference in the means of FBS, and HbA1c.

MPV values were 8.97 ± 1.28 in diabetic individuals whereas 9.14 ± 1.01 in controls. The mean of total platelet counts in test and control groups were 233.79±85.7 x 10^9/l and 291.78 ± 97.81, respectively which were statistically significant as depicted in Table 2.

Table 1: Age and sex distribution in diabetics and healthy controls.

	Diabetics	Healthy controls (non diabetics)
Number	60	40
Age (years)	51.79±16.18	39.07±15.75
Female (%)	42.6	36.7
Male (%)	57.4	46.3

Table 2: Comparison of various parameters in diabetics and healthy controls.

Variables	Diabetics Mean±SD	Non-diabetics Mean±SD	t-test	P-value
FBS	168.79±88.72	91.78±17.5	5.478	0.001
HbA1c	8.27±2.36	4.36±0.509	10.50	0.001
Platelets	233.79±85.7	291.78± 97.81	-3.165	0.002
MPV	8.97±1.28	9.14±1.01	-0.720	0.473

At the same time we compare between diabetics who HbA1c lower than 7% (diabetic controlled) and uncontrolled diabetic HbA1c more than 7, we find platelets count lower in uncontrolled diabetics and MPV larger than in controlled diabetics but this difference was not statistically significant as shown in table 3.

Table 3: Comparing between platelets count and MPV in controlled and uncontrolled diabetics according to HBA1C.

Parameters	HbA1c ≤ 7	HbA1c ≥ 7	t-test	P- value
Age	51.55±14.20	51.9±17.2	- o.79	0.937
FBS	107.35± 29.5	198.76±92.66	-4.29	0.001
Platelets	260±105.2	221.0±72.46	1.69	0.096
MPV	8.88±1.13	9.01±1.36	-0.36	0.718

DISCUSSION

DM is a complex metabolic syndrome characterized by chronic hyperglycemia resulting in complications affecting the peripheral nerves, kidneys, eyes, and micro- and macro vascular.

Platelets are small discoid blood cells that circulate and participate in hemostasis. Primary plug formation due to platelets seals the vascular defects and provides the required phospholipid surface for the recruited and activated coagulation factors.[7]

In response to stimuli generated by the endothelium of blood vessels, platelets change organelles, and aggregate to form a thrombus.[7]

These pro-aggregatory stimuli include thrombin, collagen, epinephrine, ADP (dense storage granules), and thromboxane A2 (activated platelets). Thus, platelets may assume an important role in signaling of the development of advanced atherosclerosis in diabetes.[5,7]

MPV is an indicator of the average size and activity of platelets. Larger platelets are younger, more reactive and agreeable. Hence, they contain denser granules, secrete more serotonin and β-thromboglobulin, and produce more thromboxane A2 than smaller platelets.[8-10] All these can produce a pro-coagulant effect and cause thrombotic vascular complications.

This suggests a relationship between the platelet function especially MPV and diabetic vascular complications thus indicating changes in MPV reflect the state of thrombogenesis.[3-5] Thus, DM has been considered as a"prothrombotic state" with increased platelet reactivity.[11]

In our study MPV was lower in diabetics than in controls. There was no significant statistical difference between the diabetics and healthy individual (control) whereas platelets count was lower in diabetics than control p= 0.001 that was similar to the studies done by Hekimsoy *et al*. and Demirtunc *et al*. MPV was not significantly different in subjects with diabetic neuropathy/retinopathy from that of diabetics without those complications.[2,3] Their possible explanation was centered on the rapid consumption of activated platelets in diabetics with complication or without complication. Platelets count decrease in number and increase in size in uncontrolled diabetics. However in our study, MPV was not significantly different in diabetic individuals. This was also observed in studies by Hekimsoy *et al.* This can be explained by rapid consumption of platelets in diabetics since platelets count was lower.

CONCLUSION

In our study we demonstrated MPV increase with HbA1c and higher values of MPV in uncontrolled diabetics when compared to controlled diabetic and platelets count was lower in diabetics when compared with healthy individuals. Thus in DM, platelets are large, hyperactive and aggregable in uncontrolled diabetics leading to increased risk of atherosclerosis and associated vascular complications. However, the increased MPV as the cause or the end result of vascular complications needs to be further explored. Thus, we propose MPV as a simple, reliable, cost effective accessory tool to monitor the progression of DM and its complication.

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