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Physiology

PLATELET MORPHOLOGY, BLEEDING TIME & CLOTTING TIME IN DIABETIC & HEALTHY FEMALES

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ABSTRACT

Background: Platelet hyperreactivity in conditions like diabetes mellitus has been considered as evidence for many systemic dysfunctions. Platelets exposure to hyperosmolar solutions may increase platelet reactivity, further hyperglycemia leads to direct osmotic effect.

OBJECTIVE: This study is performed to assess the platelets morphology in control & diabetics.

MATERIALS & METHODS: This study is performed in Alluri Sita Rama Raju academy of medical sciences (ASRAM), Eluru. Platelet count was performed by REES-ECKER method in dept of physiology, ASRAM. 30 females were considered in each group. Platelet morphology is performed through Thyrocare. Height and weight were measured with the subject in light clothes without shoes and body mass index (BMI) (kg/m2) was calculated. Statistical analysis was done by Microsoft office 2010. Predefined inclusion and exclusion criteria were set for selection of the study group.

Results: Platelet Distribution Width, Mean Platelet Volume, Platelet Count, Bleeding time, Clotting Time was found statistically significant. Diabetic patients who are having micro & macro vascular complications, retinopathy and nephropathy were excluded. The patients who are on antibiotics were excluded.

Conclusion: There is an increase in MPV, PDW, PC, BT and CT in diabetic females as compared with control. This indicates increase in blood glucose levels may act on insulin receptors on platelets. Increase in platelet count may be an indicator of elevated blood glucose levels & future vascular complications.

KEYWORDS : Mean Platelet Volume (MPV), Platelet Distribution Width (PDW), Platlet Count (PC), Clotting Time (CT), Bleeding Time (BT), fasting blood glucose levels.

Introduction:

Platelet hyperreactivity in conditions like diabetes mellitus has been considered as evidence for many systemic dysfunctions. Platelets exposure to hyperosmolar solutions may increase platelet reactivity, further hyperglycemia leads to direct osmotic effect [1]. Protein kinase C activation is seen in conditions like chronic & acute hyperglycemia [2]. A low level of cAMP release is observed in diabetic people, when compared with nondiabetic [3]. Platelets from patients with diabetes mellitus have dysregulated signaling pathways that lead to an increased tendency to activate & aggregate in response to platelet hyperreactivity [4,5].

Insulin can directly regulate platelet function through functional insulin receptor found on human platelets [6]. It was proved in healthy nonobese individuals that insulin inhibits platelets interaction with collagen & hence reduces platelet aggregation [7]. Increased platelet activity may lead to development of vascular complications [8]. Diabetic people have increased risk of developing micro & macrovascular disease, which is due altered platelet morphology [9]. The platelet activation & reduced fibrinolytic activity is seen in diabetic mellitus [10]. It was proved in diabetic patients that increase in blood glucose levels leads to several vascular complications, increase in platelet adhesion & aggregation, thrombaxane synthesis [11].

MATERIALS & METHODS:

This study was conducted at ASRAM Hospital, Eluru in Central Lab. 30 females were considered in each group. Totally, study was conducted on 60 females and having age 50–60 years.

In this study we compared serum blood glucose levels at early morning before breakfast in control & study group women. Mean platelet volume, platelet distribution width & platelet count tests were performed in study & control group women. We excluded diabetic, obese and any chronic disordered women. Height and weight were with the subject in light clothes without shoes and Body Mass Index (BMI) was calculated kg/m2.

The considered subjects were interviewed and basic history was taken into consideration. The subjects were given proper precautions and self-consent form was taken before drawing blood.

Results

We evaluated totally of 120 females and considered 60 females in control & study group. The average taken into consideration is 50 – 60 years. We excluded females, who are having blood glucose levels more than 250mg/dl. Platelet Distribution Width, Mean Platelet Volume, Platelet Count, Bleeding time, Clotting Time was found statistically significant. Diabetic patients who are having micro & macro vascular complications, retinopathy and nephropathy were excluded. The patients who are on antibiotics were excluded. Nearly 90% of females in our study group are having family history of diabetes. The females in whom blood glucose levels were high since 6 months were specially considered.

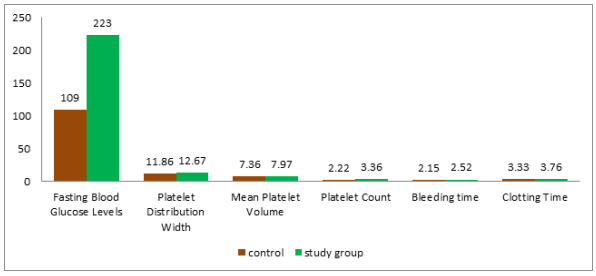
In our study we observed elevated Platelet Distribution Width, Mean Platelet Volume, Platelet Count, Bleeding time, Clotting Time in study group subjects. Body mass index & waist hip ratio were decreased in diabetic subjects as compared with control group people.

Table 1

S. NO	VARIABLE	Control MEAN±STDEV	Study Group MEAN±STDEV	"p" VALUE
1	Fasting Blood Glucose Levels	109±5.12	223±39.28	0.05
2	Platelet Distribution Width	11.86±0.40	12.67±2.14	0.02
3	Mean Platelet Volume	7.36±0.36	7.97±0.52	0.05
4	Platelet Count	2.22±0.17	3.36±0.51	0.05
5	Bleeding time	2.15±0.15	2.52±0.41	0.05
6	Clotting Time	3.33±0.36	3.76±0.46	0.05
7	Body Mass Index	22.78±2.08	22.17±1.86	0.12
8	Waist Hip Ratio	0.76±0.05	0.75±0.05	0.17

GRAPH 1:

Graph plotted between fasting blood glucose levels, platelet morphology, platelet distribution, platelet count, bleeding time & clotting time



Discussion:

Hyperglycemia can increase platelet reactivity by including nonenzymatic glycation of proteins on the surface of the platelets, by the osmotic effect of glucose & activation of protein kinase C [12]. The Diabetic patients expresses more P-selectin & glycoprotein receptors on platelet surface & are more sensitive to agonist stimulation than platelets from patients without diabetes [13]. Platelets from diabetic patients expresses dysregulated signaling pathways that leads to an increased activation & aggregation [14].

Platelets are small, anucleated, granulated, spherical or oval bodies, 2-4μm in diameter. They contain α & β granules. The α-granules contain platelet derived growth factor, platelet factor 3, fibronectin, plasminogen, platelet fibronectin, proaccelerin, thrombospondin, α-2 plasmin inhibitor & hydrolases. The dense granules contain serotonin, ADP & calcium ions [15]. The platelet hyper reactivity leads to increase in von willebrand factor, platelet activating factors, fibrinogen, thrombin, ADP & thromboxane A2 & further leads to platelet adhesion, aggregation & activation [16]. Larger platelets are younger, more reactive & agreeable. Increase in MPV, stimulates dense granules, and secretes more serotonin & β-thrombomodulin. This leads to production of more thrombaxane A2 than smaller platelets [17]. All these factors can cause pro-coagulant effect & cause thrombotic vascular complications. This suggests a relationship between the platelet function especially MPV & diabetic vascular complications thus indicating changes in MPV & reflect the state of thrombogenesis[18].

Antiplatelet drugs interfere with platelet activation in the setting of pathologic atherothrombosis, but potentially also during physiological haemostasis [19]. Increased MPV & increased CAD incidence in chronic hemodialysis patients [20]. Increase in platelet volume may result in reduced platelet count. Elevated MPV in diabetic patients is associated with decreased platelet survival [21].

Conclusion:

There is an increase in Mean Platelet Volume, Platelet Distribution Width, Platelet Count, Clotting Time and Bleeding Time in diabetic females as compared with control. This indicates increase in blood glucose levels may act on insulin receptors on platelets. Increase in platelet count may be an indicator of elevated blood glucose levels & future vascular complications. The patients who are having hyperglycemia should undergo MPV test & along with fasting blood glucose test for the prevention of future complications.

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