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Study the Correlation between Mean Platelet Volume and HbA1c in Type 2 Diabetes Mellitus with Special Reference to Microvascular Complication

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ABSTRACT

Background: Diabetes mellitus is the most common endocrine disease characterized by metabolic abnormalities, hyperglycemia and by long term complications. Large platelet are younger, more active and aggregable, have dense granules, secrete more proaggregatory molecules. Platelet activation contributes to trigger thrombus formation and causing microcapillary embolization. Platelet is directly regulated by insulin via functional insulin receptor found on human platelets. Insulin inhibits platelet interaction with collagen and attenuates the platelet aggregation effect of agonist in healthy platelets. MPV, a determinant of platelet function, is a newly emerging risk factor for atherothrombosis. Increased in HbA1c concentration is directly proportional to increased MPV. MPV can emerge as an important, simple, effortless, and cost-effective tool for monitoring and for early recognition of patients that could possibly benefit from preventive treatment. **Methods:** It is a comparative study conducted in 98 patients admitted in Sri B.M Patil Medical College and Hospital, who are already diagnosed to have Type 2 DM with more than five years duration and 98 non-diabetic subjects without known microvascular complication. MPV is measured in cases and control groups. Patients were selected on the basis of inclusion and exclusion criteria and statistically analyzed. The study was conducted between December 2017 to july 2019. **Results:** In our study, MPV was significantly higher in diabetics with HbA1c levels ≥ 6.5% than in diabetics with HbA1c levels <6.5%. Among the 98 study group participants total 92 patients had one or more microvascular complications. Of the microvascular complication evident in the form of retinopathy, nephropathy and neuropathy, diabetic neuropathy was the most common, followed by diabetic nephropathy. **Conclusion:** Changes in MPV are seen to be statistically associated with diabetes and its complications. They are easily available, simple, convenient, noninvasive, and easy to interpret method to determine platelet dysfunction and in turn predict the presence of microvascular complications.

Keywords: Diabetes Mellitus, HbA1C, Mean Platelet Volume.

INTRODUCTION

Diabetes mellitus (DM) is the most common endocrine disease characterized by metabolic abnormalities, hyperglycemia, and by long term complications.

Large platelets are younger, more active and aggregable, have denser granules, secrete more pro-aggregatory molecules.

Platelet is directly regulated by insulin via a functional insulin receptor found on human platelets. Insulin inhibits platelet interaction with collagen and attenuates the platelet aggregation effect of agonist in healthy individuals.

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MPV, a determinant of platelet function, is a newly emerging risk factor for atherothrombosis. In many studies it has been found that increased in HbA1c concentration is directly proportional to increased MPV.

MATERIALS AND METHODS

To study correlation between mean platelet volumes (MPV) and HbA1c in type 2 diabetes mellitus.

Determine if the MPV in the diabetic patients is higher compared to the non-diabetics.

To see if there is a difference in MPV in diabetics with and without microvascular complications

Inclusion Criteria

- Patients already diagnosed to have Type 2 diabetes mellitus with more than five years duration of diabetes.
- Controls are non-diabetic.

Exclusion Criteria

- Hb <13gm% - males

- Hb <12gm% - females
- Non-diabetic subjects with coronary artery disease (ECG changes).
- Patients on antiplatelet drugs such as aspirin and clopidogrel.
- Diabetic subject with less than five year duration of diabetes.

Study Design

The study has been carried out in 100 patients who are already diagnosed to have Type 2 DM with more than five years duration and 100 non-diabetic subjects without known microvascular complication.

RESULTS & DISCUSSION

In this study, 100 individuals with T2DM and 100 nondiabetic controls were included. Both groups were age and gender matched. The majority of the individuals were between the age group of 31 60 yrs.

Comparison of Baseline characteristics between two groups

Variables	Compared groups	Mean	Std. Deviation	t test/Mann Whitney U test	P value	Remark
Age	Study group	62.37	10.996	t=0.78	P=0.408	NS
	Control group	61.26	11.576			
RBS	Study group	242.03	108.321	U=1169.500	P=0.0001	HS
	Control group	118.70	27.950			
FBS	Study group	182.70	87.653	U=2486.50	P=0.0001	HS
	Control group	112.00	20.252			
PPBS	Study group	211.83	83.051	U=1934.500	P=0.0001	HS
	Control group	133.04	20.383			
HbA1C	Study group	9.069	2.65	U=727.000	P=0.0001	HS
	Control group	5.723	0.880			
MPV	Study group	12.017	1.227	U=1204.500	P=0.0001	HS
	Control group	9.737	1.365			
Platelet	Study group	2.541	0.837	U=4938.000	P=0.201	NS
	Control group	2.433	0.916			
serum creatinine	Study group	1.707	1.827	U=4356.500	P=0.009	HS
	Control group	0.892	0.272			

Table Correlation between HbA1C and MPV

Correlation between HbA1C and MPV

Correlation between	Correlation coefficient®	P value	Remark
HbA1C(<6.5) and MPV	r=0.2645	P=0.3050 NS	Moderate positive correlation. statistically not significant
HbA1C(≥6.5) and MPV	**r=-0.428**	P=0.0426 Sign	Moderate positive correlation. statistically significant.

NS: Not significant Sign :Significant

The mean MPV of study group is 12.017 and that of control group is 9.737.

The correlation between HbA1C and MPV shows that at HbA1C <6.5, correlation coefficient® with MPV was r=0.2645 with P=0.3050. Thus, there is moderate positive correlation which is statistically not significant

At HbA1C ≥ 6.5, correlation coefficient® with MPV was r=0.428 with P=0.0426. Thus, there is moderate positive correlation which is statistically significant.

It was also observed that the MPV were significantly higher in diabetic individuals with microvascular complications as compared to those without complications

Of the 100 diabetic patients in study group 92 individuals had microvascular complications. They were noted as diabetic retinopathy, diabetic neuropathy and diabetic nephropathy. The diabetic neuropathy was most common as a single microvascular complication. Few patients had any two of the three common microvascular complications.

Whereas, 4 patients had all three microvascular complications. Among all these presentations, diabetic neuropathy was most common as a singlemicrovascular complication at 28%.

Microvascular complications	No. of subjects	Perecentage
Diabetic Retinopathy	7	7%
Diabetic Neuropathy	32	32%
Diabetic Nephropathy	28	28%
Diabetic Retinopathy+ Diabetic Nephropathy	4	4%
Diabetic Retinopathy+ Diabetic Neuropathy	7	7%
Diabetic Nephropathy+ Diabetic Neuropathy	10	10%
Diabetic Retinopathy+ Diabetic Nephropathy+ Diabetic Neuropathy	4	4%

CONCLUSION

Changes in MPV are seen to be statistically associated diabetes and its complications. They are easily available, simple, convenient, noninvasive, and easy to interpret method to determine platelet dysfunction and in turn predict the presence of microvascular complications.

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