ORIGINAL ARTICLE

Platelet Distribution Width in Diabetic Nephropathy: A Cross Sectional study

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ABSTRACT

Introduction: There is an estimated 424.9 million people with diabetes mellitus(DM) in 2017(3). It is believed to be a state of increased platelet reactivity and a 'procoagulant milieu', resulting in a variety of microvascular complications Platelet indices like mean platelet volume (MPV), platelet distribution width (PDW) etc., have been investigated as potential indicators of microvascular complications in diabetes. Our study was aimed at evaluating the PDW in diabetic patients with nephropathy versus those without in order to assess their utility as indicators of microvascular complications. **Methods:** This cross sectional study included 330 patients presenting to a tertiary care centre with DM(165 with nephropathy and 165 without nephropathy). Nephropathy was defined as either microalbuminuria (30-300mg/24 hours urinary albumin excretion) or macroalbuminuria (>300mg/ 24 hours urinary albumin excretion). Patients without nephropathy were defined as a urinary albumin excretion of <30 mg/ 24 hours urinary albumin excretion. Blood was collected in an EDTA tube and analyzed in an automated blood cell counter for platelet count and platelet distribution width. **Results:** In our study, it was found that the average PDW in those with nephropathy was higher than in those without (17.13 vs 14.31, a difference of 2.82, p=0.0005). The higher values of PDW indicates that it could serve as a risk indicator of vascular complications in such patients especially nephropathy. **Conclusion:** The platelet indices, especially PDW, can serve as an indicator for microvascular complications especially nephropathy in patients with DM. Its easy availability and cost effectiveness contribute to its utility in such patients.

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INTRODUCTION

Diabetes mellitus is one of the leading risk factors for adverse macrovascular and microvascular events all over the world. The 'Pro coagulant' milieu that exists in these patients is believed to be responsible. It is believed that increased platelet sensitivity and reactivity contribute heavily to the existence of such a state(1). Several studies have shown that the Platelet Distribution Width (PDW) is higher in diabetics than in the general population. The PDW along with the Mean Platelet Volume (MPV) are believed to reflect the functional status of the platelets. They are readily available as a part of most complete hemograms. Their utility in the prediction of complications in these patients are as yet not clearly elucidated. This study aims to assess the predictive value of the PDW in identification of patients who are more likely to develop microvascular complications, especially diabetic nephropathy.

MATERIALS AND METHODS

The This cross sectional study included 330 patients presenting to a tertiary care centre with diabetes mellitus(DM). The diagnosis of DM was established using the American Diabetes Association criteria(2). Important exclusion criteria included patients with types of DM other than Type 1 or 2, patients on antiplatelets, anticoagulants, ACE inhibitors or ARBs, patients with co existent hypertension, recent history of blood transfusion or recent systemic infections (<1week), recent urinary tract infections, patients with chronic liver disease and patients on drugs that may interfere with either the number or function of platelets. They were divided into those with nephropathy and those without. Nephropathy

was defined as either microalbuminuria (30-300mg/24 hours urinary albumin excretion) or macroalbuminuria (>300mg/ 24 hours urinary albumin excretion). Patients without nephropathy were defined as a urinary albumin excretion of <30 mg/ 24 hours urinary albumin excretion. The calculated sample size was 330 patients, 165 of these patients had nephropathy, and 165 patients did not have nephropathy.

For the tests involved for platelet indices, 2ml of venous blood was collected in an EDTA vacutainer from the antecubital vein and analyzed in an automated blood cell counter. A sterile container was used to collect the urine samples for urine albumin testing. Appropriate statistical tests were used to assess the significance of difference between the groups.

ETHICAL CLEARANCE

Ethical committee approval from the SMCH-IEC-Institutional review board was obtained (Approval number: SMC/IEC/2021/03/005).

RESULTS

Data was collected with the help of IBM SPSS Statistics for Windows, version 23.0. Frequency analysis, percentage analysis, mean, and S.D, were employed for categorical and continuous variables respectively. The independent sample t-test was employed to determine the significant difference between the bivariate samples in independent groups. Chi-square analysis was performed to determine the relevance of qualitative categorical data. A probability value of < 0.05 was considered as being statistically significant.

The average age of patients in the control group was 47.7 years and among the cases were 48.2 years. Age groups 18-20, and above 80 years, were the least represented(1.2%) among the cases.The number of females in our study were 78(47.2%) and number of males were 87(52.7%) among the cases and 80 females(48.4%) and 85 males(51.5%) in the control group.

Among the 330 patients, 165 patients had nephropathy, while the other 165 patients did not. The average fasting blood glucose (FBS) among the cases were 173.3 mg/dl, while among the controls it was 169.04 mg/dl(Table I). The average post prandial blood glucose (PPBS) was 224.48 mg/dl among the cases and 207.78 mg/dl among the controls (Table I). Among the patients with nephropathy, the average PDW (Table II and Fig.1.) was 17.13% and among the patients without, it was 14.31% with a p value of 0.0005.

Table I: Comparison of FBS and PPBS between the two groups

Variable	Groups	N	Mean	SD	t-value	p-value
FBS	Cases	165	173.73	49.43	0.943	0.346#
	Controls	165	169.04	40.36		
PPBS	Cases	165	224.48	77.87	2.201	0.028*
	Controls	165	207.78	58.58		

No Statistical Significance at p < 0.05 level
*Statistically significant at p <0.05 level

Table II: Comparison of PDW between the groups by independent sample t-test

Variable	Groups	N	Mean	SD	t-value	p-value
PDW	Cases	165	17.13	1.57	18.493	0.0005**
	Controls	165	14.31	1.17		

** Highly Statistical Significance at p < 0.01 level

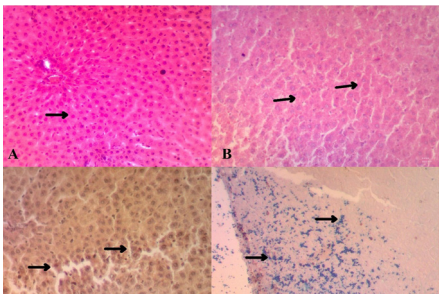

Fig 1: Comparison of PDW between the groups

DISCUSSION

Diabetes is on the rise worldwide, with an estimated 424.9 million people with diabetes in 2017(3). Among the Indian population, the prevalence of diabetes mellitus is around 8.8%(4). Patients with diabetes mellitus are known to have a higher risk of developing microvascular and macrovascular complications leading to an increased morbidity and mortality. Diabetes is now known to be a 'procoagulant' milieu with accelerated atherosclerosis, inflammation and thrombus formation. It is believed that the attendant hyperglycemia and insulin resistance in diabetics causes increased platelet

reactivity directly as well as through glycation of platelet proteins (5). Endothelial dysfunction is also implicated in the accelerated atherosclerotic changes seen in these patients (6).Larger platelets are believed to have more dense granules, secrete more serotonin and beta-thromboglobulin, contributing to increased thrombogenicity (7). The MPV and PDW are indices that denote the size and variability of the platelets respectively.

There have been studies performed on the association between platelet indices and microvascular complications in diabetes mellitus. Studies like this one by Jindal et al (8) showed that the platelet indices MPV, PDW and platelet-large cell ratio were all significantly higher in diabetic patients as compared to the controls. Among those with diabetes, PDW was higher in those with complications compared to those without (p=0.006). Similar results were demonstrated by Walinjkar et al (9), where the platelet indices (MPV, PDW, plateletcrit, and platelet-large cell ratio) were found to be higher in diabetics with microvascular complications than those without.

In our study, the most common age group of our population was 41-50 years (26.3%). There was a male preponderance (52.2% vs 47.8%). 52.7% of our patients had nephropathy while 47.3% did not. The average PDW in those with nephropathy was higher than in those without (17.13 vs 14.31, a difference of 2.82, p=0.0005). This was in line with previous studies showing an increased PDW among diabetic patients with microvascular complications. The higher values of PDW indicates that it serves as a better risk indicator of vascular complications in patients with DM especially nephropathy and can be used as a simple, cost effective tool to assess vascular events among these patients.

CONCLUSION

The results of our study are in line with previous studies highlighting the differences in the PDW in diabetics with microvascular complications and those without. The larger platelets and the procoagulant milieu prevalent in diabetics are believed to be one of the main driving forces in the increased morbidity and mortality seen in these patients. Platelet indices, including the PDW can thus be incorporated into the workup of such patients, where they may be useful in predicting microvascular complications in these patients.

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