Platelet Count and its Correlation with Blood Sugar Level in Type 2 Diabetes Mellitus Patients

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Abstract

Introduction: Diabetes Mellitus (DM) is defined as a complex disease with chronic hyperglycemia and is a global public health problem; the long-term sequelae of which are long-term macrovascular and microvascular complications. Studies show role of hematological indices especially platelet indices in contributing to the vascular injury in diabetic patients. Thus, the aim of this study was to determine platelet indices and their correlation with fasting blood glucose level in type 2 DM patients in comparison with healthy controls.

Method: A retrospective study was conducted at DM Wayanad Institute of Medical Sciences, Kerala, India from 1st of January 2018 to 31st of June. A total of 238 participants (119 cases and 119 healthy controls) were selected using systematic random sampling technique. Data is retrieved from Medical Records Department. Parameters are lab investigation values those are already done on patients who came to DM WIMS. FBS was estimated using (Cobasintegra 400 plus) automated clinical chemistry analyzer and hematological parameters using fully automated (Sysmex XT-1800i) analyzer.

Independent sample t-test. The sample size required to study the correlation is 90 at 5% level of significance and 80% power assuming the population correlation to be 0.3 (moderate correlation). The statistical analysis was done using SPSS 15.0 version. After checking for normality Pearson’s or Spearman correlation analysis is carried out to study the correlation. A P-value, 0.05 was considered as statistically significant.

Result: There was no significant correlation between platelet indices, mean platelet volume, platelet distribution width in the diabetic patients.

Conclusion: Even though previous study showed statistically significant difference in platelet indices of diabetic patients compared to controls in our study there is no such statistical significance. Further studies should be done in large population.

Keywords: Fasting blood glucose, platelet indices, platelet count, platelet distribution width, type 2 diabetes mellitus.

Introduction

Many epidemiological and pathological studies show that diabetes is an independent risk factor for Cardiovascular diseases in both men and women. By definition Diabetes Mellitus is a metabolic-cum vascular syndrome of multiple aetiologies characterized by chronic hyperglycaemia with disturbances of carbohydrates, fat and protein metabolism resulting from defects in insulin secretion, insulin action or both. Many researches shows that haematological parameters are altered in Diabetes Mellitus.1 High levels of glucose in Diabetes causes fluctuations in metabolism of cells which seems to contributed by increased production of reactive oxygen species (ROS) and nonenzymatic glycation of many macromolecules. This results in changes in structure and function of cells and production

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of advanced glycation end products (AGEs). They interact with specific receptors known as RAGE and increases disturbances in metabolism and leads to disruption of basement membrane which changes permeability and vasodilation.

It has been found in a study that high vascular complications are related to high platelet activity. Mean platelet volume (MPV) is a marker showing platelet function and activation. So altered platelet morphology and function can be reflected as a factor for risk of microvascular and macrovascular diseases. In many studies it has been reported that increased platelet reactivation in patients with diabetes may be related to less cardiovascular protection with antiplatelet therapy.

Previously some studies proved that insulin resistance (IR) and hyperinsulinemia are associated with the stimulation of erythroid progenitors and increased levels of inflammatory markers.

Materials and Method

The study done was a comparative cross-sectional study at DM Wayanad Institute of Medical Sciences, Kerala, India. Data including Fasting blood sugar and haematological parameters like Platelet count and platelet distribution width of patients aged between 25 and 70 years were collected from hospital record of above mentioned institute. Duration of the study was from 1st of January 2018 to 31st of June. Parameters are lab investigation values those are already done on patients who came to DM WIMS central lab and procedure was done by collecting 2ml Fasting blood sample & FBS was estimated using (Cobasintegra 400 plus) automated clinical chemistry analyzer. 2ml of venous blood were collected for hematological parameters using fully automated (Sysmex XT-1800i) analyzer.

Sample size: Hematological parameters of 119 patients with FBS below 126 mg/dl is collected and considered as control group.

Hematological parameters of 119 patients with FBS above or equal to 126 mg/dl is collected and considered as study group. Age and sex was matched.

Inclusion criteria: (a) Control group includes the data of patients whose FBS ≥ 126 mg/dl

Exclusion criteria: Severely ill patients, infected patients, pregnant women, on antihypertensive treatment, on antiplatelet drugs, on statins, and who had other chronic disease were excluded from the study.

Statistical analysis: The sample size required to study the correlation is 90 at 5% level of significance and 80% power assuming the population correlation to be 3 (moderate correlation).

Statistical analysis: The statistical analysis was done using SPSS 15.0 version. After checking for normality Pearson’s correlation analysis was carried out to study the correlation.

Ethical consideration: Ethical clearance was obtained from Research and Ethical Committee of DM Wayanad Institute of Medical Sciences, Kerala, India. A permission letter was also taken from the Hospital Superintendent head for collecting data from hospital record. For maintaining confidentiality of study participant’s information, the data was stored in password protected computer of principal investigator.

Results

<table>
<thead>
<tr>
<th>Variables</th>
<th>T2DM (Mean ± SD)</th>
<th>Controls (Mean ± SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>49.09 ± 8.1</td>
<td>47.86 ± 6.8</td>
</tr>
<tr>
<td>Male/female, n (%)</td>
<td>64 (53.78%)/55</td>
<td>64 (53.78%)/55</td>
</tr>
<tr>
<td>(46.21%)</td>
<td></td>
<td>(46.21%)</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Variables</th>
<th>Mean ± SD</th>
<th>Mean ± SD</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platelet count</td>
<td>0.98 ± 2.61</td>
<td>2.28±1.05</td>
<td>0.132</td>
</tr>
<tr>
<td>Platelet distribution width (PDW)</td>
<td>11.35±2.19</td>
<td>10.97±1.65</td>
<td>0.088</td>
</tr>
<tr>
<td>Platelet distribution width/Platelet count</td>
<td>5.26 ±3.58</td>
<td>4.37±2.18</td>
<td>0.156</td>
</tr>
</tbody>
</table>
Table 3. Pearson’s correlations (r) of platelet indices with TBS among T2DM patients and healthy controls at DM Wayanad Institute of Medical Sciences, Kerala, India (n=238)

<table>
<thead>
<tr>
<th>Variables</th>
<th>T2DM group (r)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Platelet count</td>
<td>-0.114</td>
</tr>
<tr>
<td>Platelet distribution width (PDW)</td>
<td>0.138</td>
</tr>
<tr>
<td>Platelet distribution width/Platelet count</td>
<td>0.154</td>
</tr>
</tbody>
</table>

Discussion

Our study compared the platelet indices between the control and the diabetic patients. We observed no significant difference in platelet count between diabetic and control groups. This is in accordance with a previous study where the study was done as a correlation between haematological parameters including platelet count and platelet distribution width among diabetic and control groups. 

But in a study where they evaluated regarding platelet indices in diabetes mellitus patients they concluded that the mean platelet counts were significantly lower in diabetics compared to non-diabetic healthy controls. However there is a negative correlation in the present study between platelet count and FBS in T2DM group even though it is not statistically significant. But in the case of platelet distribution width (PDW) and ratio between platelet distribution width (PDW) and platelet count the correlation is positive even though the significance is low. A meta analysis study concluded that platelet volume and platelet distribution width increased in type 2 diabetes mellitus but that is not the case of platelet count. Platelet distribution width (PDW) to platelet count (PC) ratio is an index of severity of illness. The ratio of PDW/PC can be considered as an independent predictor of mortality.

Further there are several studies that have shown an increased number of large circulating platelets compared with controls. This can be attributed to vascular complications in DM patients such as small vascular bleeds due to the rupture of atherothrombotic plaques. This may lead to one marrow stimulation and recruit larger hyper active platelets.

But MPV and PDW variation in diabetics can be osmotic swelling of platelets due to high glucose in plasma and increased platelet granule secretion. Platelet functions are also altered in diabetics. Reduced membrane fluidity, altered calcium and magnesium ion homeostasis, increased arachidonic acid metabolism leading to enhanced thromboxane A2 (TXA2) production, decreased nitric oxide production, decreased antioxidant levels, and increased expression of activation-dependent adhesion molecules in DM patients may lead to increased platelet aggregability and adhesiveness. And risk factor increases in diabetic patients with coronary artery diseases as increment of immature platelet levels, platelet aggregation and platelet activation are common in them.

Conclusion

Even though previous study shows there is a correlation between FBS, PDW there was no correlation in our study. The limitation of this study is data of participant group is small and cross sectional nature of study design. Further studies with larger population and including parameters like MPV can be done in future.

Conflict of Interest: none

Source of Funding: self

References


