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Research Article

Comparative Study of Significance of Lipid Profile, Platelet Count and MPV-Diabetics and Non-Diabetics

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Abstract: Diabetes mellitus is a global pandemic and is a complex disease characterized by chronic hyperglycaemia, metabolic abnormalities and long term macro – vascular and microvascular abnormalities involving major organs. Platelet parameters such as high platelet count and mainly high Mean Platelet Volume (MPV) have been reported in diabetic patients, contributing to the increased risk of vascular disease. Its relation to lipid profile has also been documented in literature. The objective of our study is to compare the simple variables of platelet count, MPV, and lipid profiles in normoglycemics and in diabetics. This cross sectional study was conducted at Sapthagri Institute of Medical Sciences and Research Center, Bangalore, India between the periods of December 2013 to March 2104. A total of 100 cases were included with 50 being diabetics and other 50 being non – diabetics. The study documented a significant increase in total cholesterol and LDL (females>males) in diabetics. Triglycerides and VLDL (males>females) in were more in diabetics compared to the normoglycemics. Platelet count has increased more significantly in diabetic females than males and control group.MPV has increased more significantly in diabetic males than females and control group. Simple parameters like above can be used to screen patients at high risk for complications, aiding in better patient care.
Keywords: Diabetes, Platelet count, Lipid profile, MPV (Mean Platelet Volume), Microvascular

INTRODUCTION

Diabetes is a global health problem. It is associated with multiple disorders that include metabolic, cellular and blood disturbances leading to vascular complications [1]. Elevated values of MPV are associated with cardiovascular diseases, and also predict a poor outcome following acute coronary events or coronary interventions [2]. Diabetics have higher lipid levels than non-diabetics and this abnormality is exaggerated in patients with poor diabetic control [3]. We have done a comparative study between diabetics and normal subjects to study the effect of variables like plasma glucose and lipid profile parameters.

Objectives of the Study

The objective of the current study was to determine the relation of glycemic control on: lipid profile including TC, TG, HDL, LDL and VLDL and on Platelet indices including-PLT and MPV in Type 2 diabetics. A comparison was also made among the various mentioned parameters in between males and females in both the groups.

MATERIALS AND METHODS

The study included 50 patients of type 2 diabetics and 50 normal subjects. ADA Criteria of FBG >126 mg/dl was followed in the study. EDTA was used as anticoagulant. Blood was analyzed within 2 hours for platelet indices to avoid time related artifactual changes in the parameters. Plasma was also separated and analyzed for other biochemical parameters. FBG was estimated by glucose oxidase method. Blood glucose was tested using ERBA EM 360 automated biochemistry analyzer. The platelet count, MPV, Total leukocyte count and neutrophil count was done using PENTRA ES 60 Hariba five part analyzer. Lipid estimation was done by Precipitation manual and GPO-PAP methods. The diabetic category was a group of newly diagnosed cases, with patients on anti-diabetic therapy being excluded. Also excluded were males with Hb less than 13g/dl and female's with Hb less than 11.5g/l as nutritional anemia can increase the MPV and cause reactive thrombocytosis. Patients with very low fasting blood sugar levels (< 70 mg/l) raised ESR and cholesterol levels were also excluded from the study.

Statistical Analysis

Descriptive and inferential statistical analysis has been carried out in our study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented

in Number (%). Significance is assessed at 5 % level of significance.

Assumptions

- Dependent variables are normally distributed,
- Samples drawn from the population are random, Cases of the samples are independent

Analysis of variance (ANOVA) was to find the significance of study parameters between three or more groups of patients. Post-Hoc Turkey test was used to find the pair wise significance. Chi-square/ Fisher Exact test had been used to find the significance of study parameters on categorical scale between two or more groups. Pearson correlation between FBS and other variables was computed.

+ Suggestive significance (p value: $0.05<p<0.10$), *Moderately significant (p value: $0.01<p\leq 0.05$), **Strongly significant (p value: $p\leq 0.01$).

Statistical software

The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1 ,Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data and Microsoft word and Excel were to generate graphs, tables etc**.**

RESULTS

The study included a total of 100 subjects: 38 females out of which 25 were diabetic and 13 were normal subjects and 62 males out of which 25 were diabetic and 27 were normal subjects. Age group was 39-75 years.

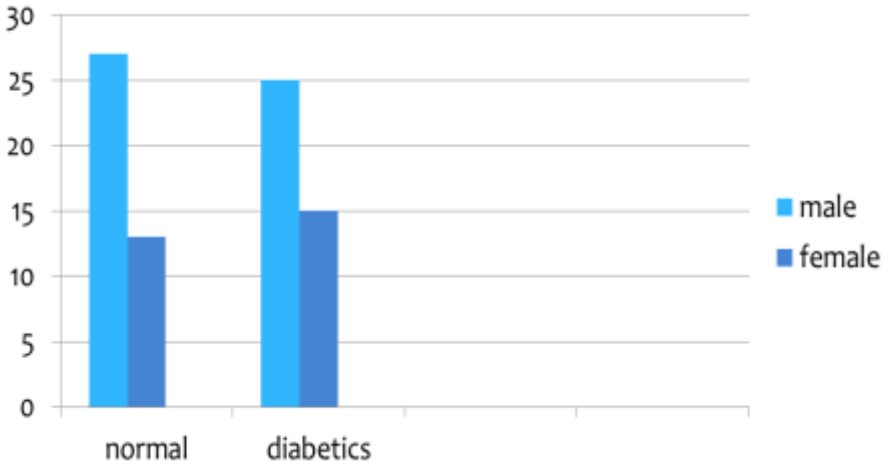

Fig. 1: Sex distribution of subjects

Fasting sugar was 92 mg/dl in the non- diabetic group and was 172 mg/dl in diabetics. The average values of the Total cholesterol (TC), Triglycerides (TG), High density lipoprotein (HDL), low density lipoprotein (LDL), Very low density lipoprotein (VLDL), platelet counts (PLT) and Mean platelet volume (MPV) have been given in Table 1. All the parameters are more in the diabetics, other than HDL with a significant p value.

Table 2: Table showing the variation in parameters between the control and diabetic groups

Parameters	Control (50)	Type 2 Diabetics (50)
FBG (mg/dl)	92.72±2.227	172.55±10.494*
TC (mg/dl)	181.50±5.247	191.92±6.708*
TG (mg/dl)	173.45±10.504	204.18±15.802*
HDL (mg/dl)	43.50±4.218	45.22±1.431
LDL (mg/dl)	101.58±5.012	110.70±5.288*
VLDL (mg/dl)	36±2.38	39±2.659*
PLT (%)	2.63±0.144	2.61±.091*
MPV (μm^3)	8.09±0.128	9.55±1.792*

* p value<0.005, Data were expressed as Mean ± SD

Table 3: Comparison of parameters between males and females in both the diabetic and non – diabetic groups

Variables	Control(50)		Type 2 Diabetics(50)	
	Male (27)	Female (13)	Male (25)	Female (15)
FBG	94.52±2.315	89±4.878	180.72±14.691	158.93±13.43
TC	177.89±6.041	189±10.203	189.96±8.497	195.2±11.259
TG	170.7±11.473	179.15±22.518	227.32±22.72	165.60±14.5
HDL	42.22±0.713	46.15±1.137	43.8±1.352	47.60±3.058
LDL	98.89±5.934	107.15±9.43	109.76±6.42	112.27±9.473
VLDL	36.30±2.84	35.7±4.52	41.64±3.73	34.73±3.27
PLT	2.50±0.215	2.84±0.132	2.41±0.102	3.02±0.125
MPV	8.06±0.172	8.15±0.192	10.50±2.649	7.57±0.207

Note: Data were expressed as Mean ± SD. TG-Triglyceride, TC-Total Cholesterol, VLDL-Very Low Density Lipoprotein cholesterol, LDL- Low Density Lipoprotein cholesterol, HDL- High Density Lipoprotein cholesterol, FBS-Fasting Blood Sugar.

The differences in parameters between males and females had shown that PLT had been increased more significantly in diabetic females than males and control group. MPV has increased more significantly diabetic males than females and control group.

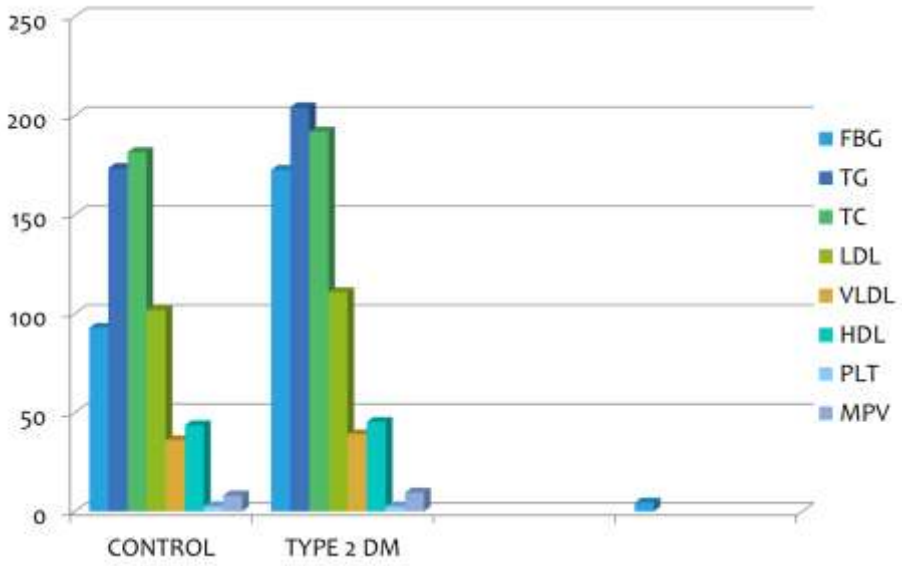

Fig. 2: Graph showing the differences in parameters between the control (non-diabetics) and the diabetic groups

DISCUSSION

DM patients often have CVD risk factors that are closely associated with the presence of insulin resistance, a possible common etiological factor, although without clear connection [4, 5]. Platelets play a major role in integrity of normal haematopoiesis. MPV is an indicator of its function. The large platelets contain more dense granules are more potent than smaller platelets and hence more thrombogenic [6]. We included MPV, in our study considering the fact that in a country like India, MPV can be used as an important, effortless, simple and cost – effective tool for predicting the possibility of impending acute events.

In addition, cholesteryl ester transfer protein (CETP) exchanges TG from VLDL to cholesterol found in HDL and LDL, leading to cholesterol-rich atherogenic VLDL particles. HDL particles that undergo these modifications are cleared more readily by the kidney, resulting in lower HDL-C levels. Randomized clinical trials have demonstrated that lipid regulating agents (statins or fibrates) significantly reduce the risk of cardiovascular events in subjects with diabetes and dyslipidemia [7].

Diabetes mellitus is a complex disease where the carbohydrate, protein and fat metabolism are impaired [8]. Insulin stimulates synthesis of fatty acid in liver adipose tissue and in the intestine and synthesis of cholesterol [9]. In diabetes mellitus abnormal increased levels of lipid, lipoprotein and lipid peroxides in plasma may be due to the abnormal lipid metabolism. Alterations of lipid metabolism are an integral part of the metabolic syndrome and diabetes and can lead to the development of cardiovascular diseases [10].

Study by Meisinger *et al*. [11] found no association between platelet count and impaired glucose regulation, as in our study. However, MPV was associated with known diabetes after multivariable adjustment, similar to our study. We affirm findings of prior studies indicating that elevated MPV may be involved in the development of vascular complications in persons with known diabetes. MPV may play a possible role in the early development of type 2 diabetes, particularly in women. We cannot exclude that unknown risk factors may have biased or confounded the present analysis.

Several measurements of platelet activity have emerged as potential contributors to atherothrombosis. Many of the parameters are time-consuming, expensive, use a high sample volume, or require specialty training [12, 13]. MPV is a marker of platelet size, determined by routine automated hemograms at a relatively low cost. Subjects with higher MPV have larger platelets that are metabolically and enzymatically more active, have greater prothrombotic potential than smaller platelets [14-16].

Several studies have stated a significant association between higher MPV and increased incidences of cardiovascular events [17-19]. The underlying mechanism of higher MPV in diabetic subjects is incompletely understood, but it is suggested that increased MPV in diabetes may occur due to osmotic swelling as a result of hyperglycemia [20]. Another study in mice revealed that insulin causes megakaryocytes to produce larger platelets [21]. Increased platelet size may reflect the presence of high platelet turnover and younger platelets [22]. Larger platelets and younger platelets are both believed to be more physiologically active and have greater prothrombotic potential [23]. Platelet activity may also serve as a potential therapeutic target.

This is an observational study, and because of the cross-sectional design, we cannot establish a causal relationship between MPV and diabetes and degree of glycemic control.

CONCLUSION

- In our study, raised platelet counts and MPV are seen in diabetics Also the MPV was more in male diabetics unlike the platelet counts which were more in females
- We also documented a positive correlation between rising blood glucose levels and triglycerides, LDL and VLDLs
- Platelet counts and MPV can be used as a simple, quick and effective tool to pick up early vascular complications in patient with impaired sugar levels, aiding in better patient care.

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