Comparison of Mean Platelet Volume in Type 2 Diabetics on Insulin Therapy and on Oral Hypoglycaemic Agents

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ABSTRACT

Introduction: Increased mean platelet volume is a known risk factor for various acute vascular complications, which is commonly associated with patients with diabetes mellitus. This study was aimed to investigate the association of Mean Platelet Volume (MPV) with Type 2 Diabetes Mellitus (DM) and to know the difference of MPV in patients on oral hypoglycaemic drugs and insulin therapy.

Material and Methods: A total of 150 patients were selected and allocated to three Groups of 50 each, referred to as DM Group on insulin therapy, DM Group on oral hypoglycaemic therapy and non-DM Group (Negative control Group). Investigations like fasting blood glucose, HB A1c and MPV were performed. Difference between the means of age, MPV were calculated by analysis of variance (ANOVA) by using Tukey's Honestly Significant Difference (HSD) test. p-value and Confidence intervals were also calculated ($p < 0.05$).

Result: The outcome of study has shown that values of MPV are increased in patients with Type 2 DM, and are significantly higher in those patients on oral hypoglycaemic therapy than patients on insulin therapy.

Conclusion: MPV is a simple and cost-effective tool which can be explored for predicting the possibility of acute vascular events in patients suffering from diabetes mellitus. Values of MPV are increased in patients with uncontrolled Type 2 DM, and are significantly higher in diabetic patients treated with oral hypoglycaemic therapy than in those patients on insulin therapy. Early initiation of insulin treatment in confirmed cases of Type 2 diabetics not only helps in controlling blood glucose level but also helps in keeping MPV low and thereby preventing possibility of impending acute vascular events.

Keywords: Diabetes mellitus, Vascular, Insulin therapy

INTRODUCTION

Mean Platelet Volume (MPV) is a new and independent risk factor for atherothrombosis. Studies have shown that increased MPV is a risk factor for myocardial infarction, cerebral ischemia, and transient ischaemic attacks [1]. Altered platelet morphology and function have been reported in patients with Diabetes Mellitus (DM) and MPV was found to be significantly higher in diabetic patients [2,3], thereby playing role in the micro- and macrovascular complications of diabetic patients [3]. The prevalence of diabetic microvascular complications is higher in people with poor glycaemic control and longer duration of DM [4].

This study was aimed to investigate and ascertain the association of Mean Platelet Volume (MPV) with Type 2 Diabetes Mellitus (DM), and to know the difference of MPV in patients on oral hypoglycaemic drugs and insulin therapy. Even though many studies have been conducted to prove the association of MPV with diabetes, present study is the first of its kind in making an attempt to know the effect of insulin and oral hypoglycaemic therapy on MPV in Type 2 diabetics.

MATERIAL AND METHODS

This is a prospective study conducted over a period of one year (from June 2012 to June 2013). The study was done on diabetic patients attending medicine OPD and diabetic clinic of the tertiary referral hospital at coastal Karnataka, India. Ethical clearance was obtained from the ethical committee of the institute and consent was obtained from each patient before including them in the study. A total of 150 subjects were selected randomly and allocated to three Groups of 50 patients each, referred to as DM Group on oral hypoglycaemic therapy (Group 1) DM Group on insulin therapy (Group 2) and non-DM Group (Group 3-negative control Group).

Inclusion criteria

- Confirmed cases of Type 2 DM, who are on oral hypoglycaemic treatment since at least 6 months.

- Confirmed cases of Type 2 DM, who are on insulin therapy since at least 6 months.

Exclusion criteria

- Cases of Type 1 DM.

- Patients with abnormal platelet counts (thrombocytosis/thrombocytopenia) and who are on anti-platelet medicines (aspirin, clopidogrel etc.).

The study was accomplished by examining the patients by taking detailed clinical history, including time since diagnosis, commencement of treatment for diabetes, and followed by clinical examination. Investigations like Fasting blood glucose, HbA1c, platelet count and MPV were performed. Blood glucose was tested using Bio Lis 24i automated chemistry analyser. Samples for MPV were collected using EDTA anticoagulant and test performed using Lab Life H3D Premier Analyser.

STATISTICAL ANALYSIS

Mean and Standard Deviations (SD) were calculated for age and MPV for all the three Groups separately. Difference between the means of age, MPV and the gender between the three Groups and within three Groups were calculated by ANOVA (analysis of variance) using Tukey's HSD (Honestly Significant Difference) test. p-value and Confidence intervals were also calculated. $p < 0.05$ was considered as statistically significant. Statistical analysis was done by using SPSS 16.

RESULTS

The study included 98 (65%) males and 52(35%) females. There were 61 diabetic male and 39 diabetic females in the study Group. The mean age of the diabetic population on oral hypoglycaemic therapy was 59.5 years, patients on insulin therapy was 56.9, whereas that of nondiabetic control Group was 44.8 years [Table/Fig-1].

	Group 1	Group 2	Group 3
Male: Female	28:22	33:17	37:13
**MPV (fL)	8.08	7.53	7.96

[Table/Fig-1]: Showing sex distribution and MPV of three different Groups

The mean MPV in Group 1 (on oral hypoglycaemic treatment) was 8.08, in Group 2 (on Insulin therapy) 7.535 and in the controls 7.966. Comparison of MPV values for the 3 Groups showed statistically significant interGroup difference (p<0.05).

DISCUSSION

A large proportion of patients with Type 2 DM suffer from preventable vascular complications. There is a need to develop risk factor modification interventions to reduce the impact of long-term complications [5]. Study by Kodiatte TA et al., showed that in diabetes mellitus, platelets become more reactive and their Mean Volume (MPV) is increased. The increased platelet size may be one factor in the increased risk of atherosclerosis associated with diabetes mellitus and associated vascular complications. Hence, MPV would be a useful prognostic marker of cardio-vascular complications in diabetes [6].

Although the underlying mechanism of higher MPV in diabetic subjects is incompletely understood, but thought to be due to osmotic swelling as a result of hyperglycemia [7]. Alternatively, increased platelet size may reflect the presence of high platelet turnover and younger platelets [8].

Although several measurements of platelet activity have emerged as potential contributors to atherothrombosis, many of these measurements are time-consuming, expensive, uses high sample volume, or require specialty training [9,10]. Alternatively, Mean Platelet Volume (MPV) is a marker of platelet size that is easily determined on routine automated hemograms and routinely available at a relatively low cost [11–14].

The Values of MPV in our study are significantly higher in patients with uncontrolled Type 2 DM (i.e Group 1-on oral hypoglycaemic treatment) compared to control Group, these findings are partly in accordance with the outcome of the study conducted by Zuberi BF et al, which showed that MPV was significantly increased in the diabetic Group, as compared to the non-DM Group [15].

In our study MPV was significantly higher in patients with Hb A1c >6.5% (some patients on oral hypoglycaemic agents) than in patients with Hb A1c <6.5% (Group2-on insulin therapy) which was in accordance with the study conducted by Kodiatte TA et al., [6]. This shows that insulin by achieving good glycaemic control and thereby keeping MPV low is playing some role in preventing vascular complications.

Study by Shah B et al., showed that mean platelet volume is strongly and independently associated with the presence and severity of diabetes. The association between MPV and diabetes was most apparent in those with the poorest glucose control [16]. In our study, study Group with good glycemic control (i.e., who are on insulin therapy) showed low MPV compared to patient whose glycemic control was just satisfactory (i.e., who are exclusively on oral hypoglycaemic drugs). This result may be due to some unexplained effect of insulin therapy producing direct or indirect beneficial effect on MPV over a course of time, by keeping the level

of MPV low. But further extensive research needs to be performed to support and justify the real benefits of this particular finding, since small sample size and study restriction to small geographic area are considered as two important limitations of our study.

LIMITATION

Small sample size and study restriction to small geographic area are considered as two important limitations of our study.

CONCLUSION

MPV is a simple and cost-effective tool which can be explored for predicting the acute vascular events in patients suffering from diabetes mellitus. Values of MPV are increased in patients with uncontrolled Type 2 DM, and are significantly higher in diabetic patients treated with oral hypoglycaemic therapy than in those patients on insulin therapy. Early initiation of insulin treatment in confirmed cases of Type 2 diabetics not only helps in controlling blood glucose level but also helps in keeping MPV low and thereby preventing possibility of impending acute vascular events.

RECOMMENDATION

Further research studies are needed to support and to assess the real benefits of our study findings in wide population.

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