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Original Research Article

Platelet profile of patients with gestational diabetes

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ABSTRACT

Background: Aim was to evaluate the differences in platelet count and platelet indices between pregnant women with gestational diabetes mellitus (GDM) and apparently healthy pregnant women.

Methods: A cross-sectional study was performed with 68 pregnant women with GDM (cases) and 68 apparently healthy pregnant women (controls) after 24 weeks of gestation. The study groups were compared in terms of demographic, clinical and laboratory characteristics including platelet count and platelet indices.

Results: Mean platelet volume (MPV) ($p=0.002^*$) and platelet distribution width (PDW) ($p=0.010^*$) were significantly increased in pregnant women with GDM compared to the apparent healthy pregnant women ($p<0.05$). MPV was well correlated with PDW ($p=0.00$).

Conclusions: The platelet indices on CBC testing can aid in identification of GDM, and can help to prevent various complications associated with GDM. The clinical relevance of these platelet indices needs further studies.

Keywords: GDM, Complete blood counts, MPV, PDW, Plateletcrit, Platelet indices

INTRODUCTION

Platelets are known to contribute to thrombosis and haemostasis. A lot of evidence points to the fact that their functions extend beyond the immediate environment of the thrombus and they have been implicated in a number of other physiological responses aimed at preservation of the integrity of the vessel. Their properties as hemostatic and inflammatory cells can result in disease states under certain conditions.¹ It is a well-known fact that pregnancy causes a lot of physiological alteration in most of the body systems, including the hematological system. During normotensive healthy pregnancies, a reduction in platelet count occurs, with between 4.4% and 11.6% developing gestational thrombocytopenia (defined as a platelet count below $150 \times 10^9/L$).²

The interaction of the platelets with the vessel wall and its subsequent contribution to atheroma formation and thrombosis is of pivotal importance in the aetiology and

pathogenesis of peripheral, coronary, cerebrovascular and other vascular diseases.³

GDM is described as glucose intolerance that is first diagnosed during pregnancy.⁴ It is mostly temporary and asymptomatic in its clinical course, but it may lead to the development of a wide range of fetal complications. GDM raises the risk of miscarriage, macrosomia, shoulder dystocia, neonatal hypoglycemia, hyperbilirubinemia, and stillbirth, and is thus associated with higher rates of cesarean birth and operative vaginal delivery.^{5,6}

Patients with DM have evidence of platelet hyper reactivity and increased baseline platelet activation. This results from a combination of factors including the effects of insulin, hyperglycemia, hyperlipidemia, endothelial dysfunction, oxidative stress, and inflammatory state.⁷

Pregnancy is characterized by a physiological strain on the endothelium.⁸ As such in pregnancy there is an increase in platelet aggregation and a decrease in the number of

circulating platelets with gestation.⁹ The MPV value of platelets is a measure of platelet activity and higher MPV values seen in diabetic pregnancies denote higher platelets activity that may lead to hypercoagulability in the placental bed with consequent vascular events, which may be responsible for fatal pregnancy complications in GDM patients.^{8,10}

Keeping this in consideration the present study was used to compare and assess the demographic and laboratory findings with respect to platelet indices in healthy pregnant women and GDM patients.

METHODS

A cross sectional study of 136 pregnant patients after proper consent having gestation of >24 weeks (68 GDM cases, 68 controls) was performed of the admitted patients in the tertiary care LD hospital (an associated hospital of GMC Srinagar) from January to March 2022. Women with systemic diseases (hypertension, collagen tissue disease, heart disease, renal disease, hepatic disease) and patients having significant drug history during gestation were excluded from the study. GDM patients were diagnosed by using international association of diabetes and pregnancy study group (IADPSG) criteria.

Table 1: IADPSG criteria for a positive 75 gm OGTT in pregnancy (24-28 weeks gestation).

| Variable | Fasting plasma glucose | 1 hour plasma glucose | 2 hours plasma glucose |
|---|------------------------|-----------------------|------------------------|
| IADPSG and American diabetes association | ≥ 92 mg/dl | ≥ 180 mg/dl | ≥ 153 mg/dl |

*Fasting glucose > 126 mg/dl, overt diabetes, *One or more values > threshold: GDM; *All 3 values < threshold: Normal.

To avoid the platelet swelling induced by ethylene diamine tetra acetate (EDTA), blood samples were analyzed within half an hour of collection.

Statistical analysis was carried out using the SPSS 26.0 computer program (SPSS Inc., Chicago, IL, USA).

RESULTS

A total of 136 subjects with gestation >24 weeks were enrolled, 68 of them that fulfilled the criteria of GDM were selected as cases and 68 subjects that did not act as control group. The two groups were matched for demographic, clinical and laboratory properties. There was statistically significant age difference between the two groups with increased mean age in GDM group ($p < 0.05$). The mean values of MPV and PDW were significantly higher in GDM group compared to the control group ($p < 0.05$) (Table 2).

The mean age of the GDM patients was 29 years, with most in the 27-30 years age group (45%).

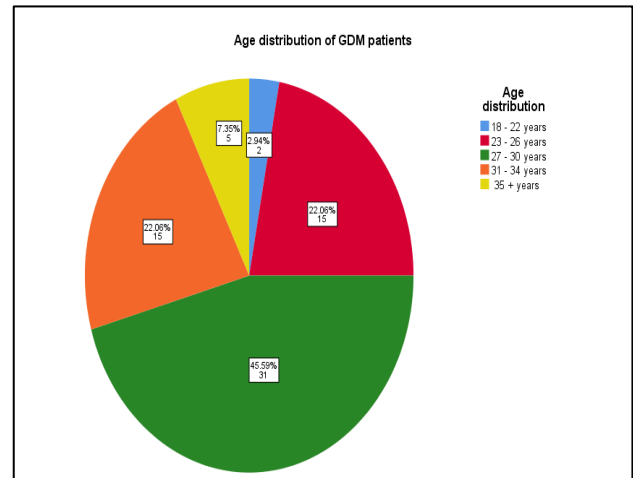


Figure 1: Age distribution of GDM patients.

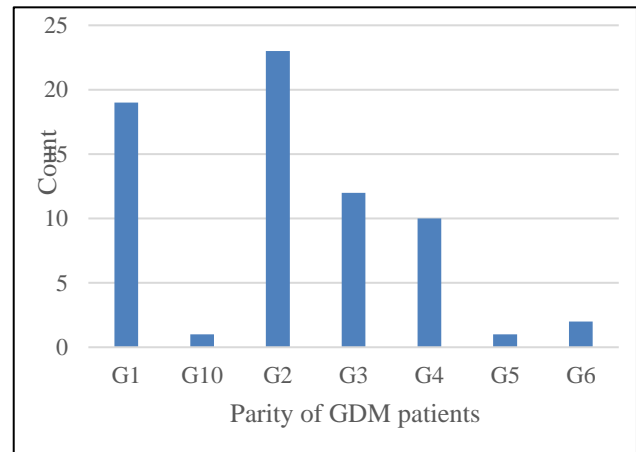


Figure 2: Parity of the GDM patients.

Maximum number of GDM patients were in their second pregnancy.

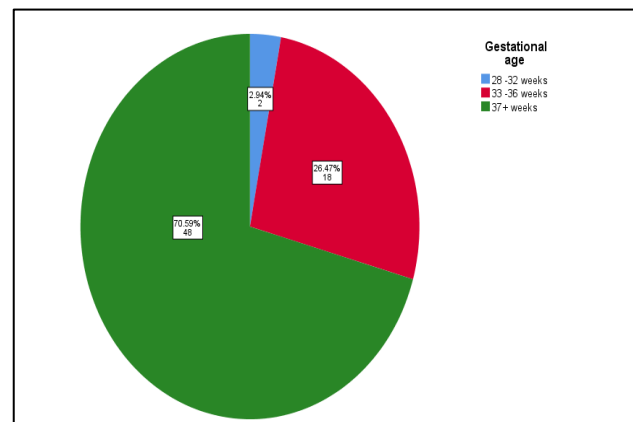


Figure 3: Gestational age of GDM patients at the time of sample collection.

Table 2: Demographic, clinical and laboratory properties of GDM and control groups (mean ± standard deviation).

| Variables | GDM | Control | P value |
|----------------|-------------|-------------|---------|
| Age (Years) | 29.16±3.53 | 28.88±3.39 | 0.047 |
| Parity | 2.47±1.55 | 2.12±0.98 | 0.592 |
| Hb | 10.45±1.42 | 10.35±1.71 | 0.972 |
| Hct | 32.68±4.60 | 32.65±4.62 | 0.404 |
| Hba1c | 6.14±0.97 | 5.07±0.41 | 0.300 |
| Platelet count | 170.00±84.9 | 193.48±89.4 | 0.167 |
| MPV | 10.61±1.37 | 10.25±1.08 | 0.002 |
| PDW | 15.00±3.08 | 13.11±2.45 | 0.010 |

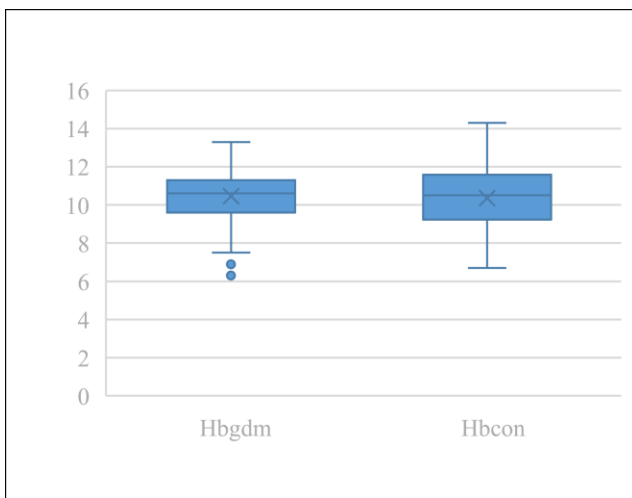


Figure 4: Box whisker plot for hemoglobin of GDM patients and controls.

The mean value of hemoglobin was slightly higher in GDM group as compared to control group.

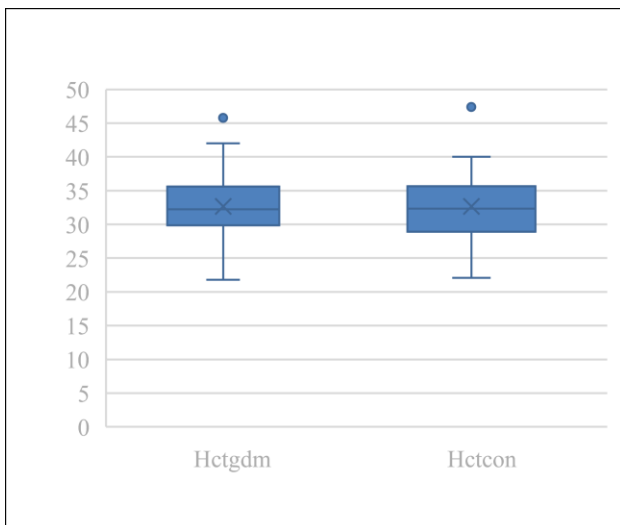


Figure 5: Box whisker plot for hematocrit of GDM patients and controls.

The maximum number of patients in the GDM group had more than 37 weeks of gestation (70%) at the time of collection of samples.

The mean value of hematocrit in both GDM and control was almost similar (32%).

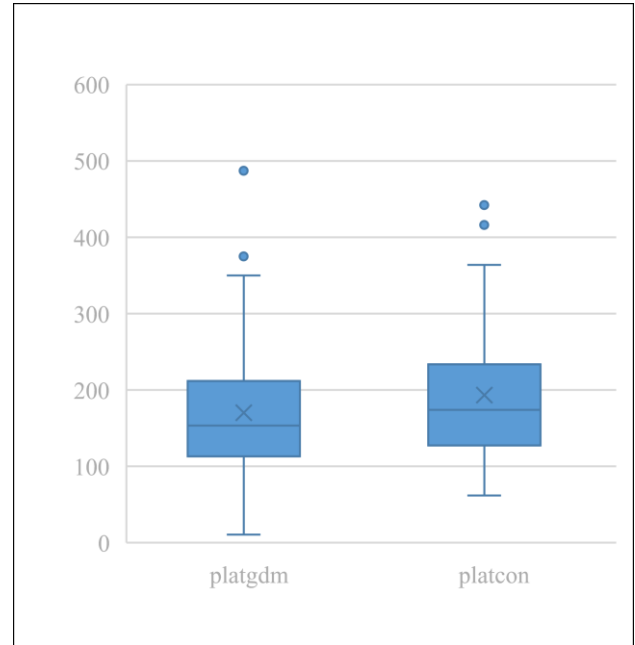


Figure 6: Box whisker plot for platelet count of GDM patients and controls.

The mean platelet count was on the lower side $170 \times 10^3/\mu\text{L}$ in GDM group as compared to control group. The difference was not statistically significant ($p > 0.05$).

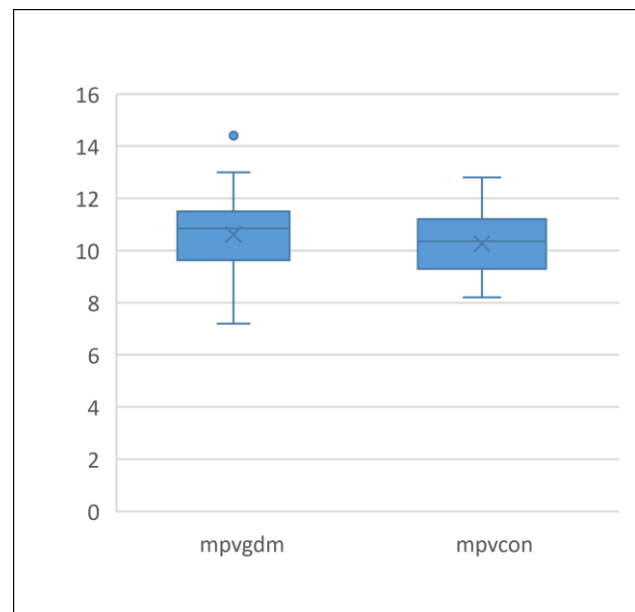


Figure 7: Box whisker plot for MPV of GDM patients and controls.

The mean MPV in GDM group was higher (10.6 fL) than control group and was statistically significant $p < 0.05$.

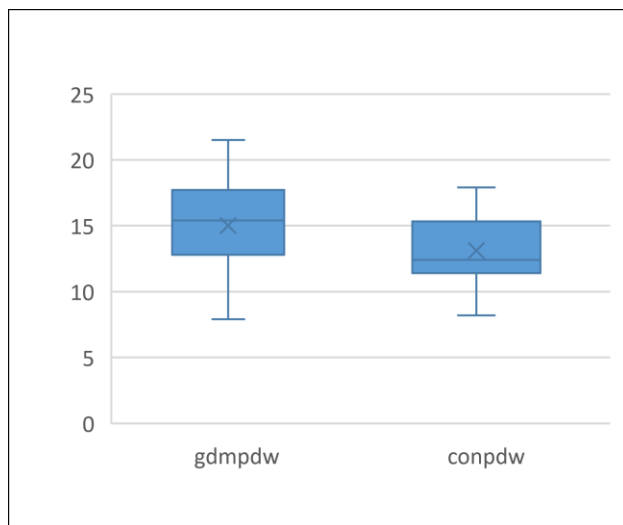


Figure 8: Box whisker plot for PDW of GDM patients and controls.

The mean PDW in GDM group was more (15 fL) than control group and the difference were statistically significant $p < 0.05$.

DISCUSSION

GDM is known to be associated with poor maternal and fetal outcomes.¹¹ The present study was undertaken to study the correlation between platelet indices and GDM so that a simple CBC test done after 24 weeks of gestation could predict early risk of developing of GDM and treatment thereof so as to reduce the risks associated with it. Our study results suggested that platelet indices PDW and MPV were statistically correlated with GDM.

Platelets are known to play an important and essential role in hemostasis and thrombosis. Multiple factors including the effects of insulin, hyperglycemia, hyperlipidemia, endothelial dysfunction, oxidative stress, and inflammatory state lead to platelet hyper reactivity and activation in diabetes mellitus.⁴ In our study the results showed that GDM group had increased MPV than the control group. Our results were consistent with the results of meta-analysis of Zhou et al and Sak et al which showed GDM patients had increased MPV than normal healthy pregnant women.^{12,13} In a study by Dong et al results showed that platelet parameters MPV and PDW in GDM group increased by late pregnancy compared to normal healthy pregnancy group.¹⁴ MPV values have been found to be higher in case of diabetes mellitus which leads to vasoconstriction vein occlusion and decreased prostacyclin resulting in vasoconstriction at venous levels and related complications.^{15,16} Increased MPV is a measure of increased platelet activity and higher values of it in diabetic pregnancies may be responsible for

hypercoagulability in the placental bed with consequent vascular events, which may be responsible for fatal pregnancy complications in GDM patients as such more focus on these platelet parameters at economical cost can benefit to identify and prevent complications- both maternal and fetal related to GDM.^{8,10}

Strengths and limitations

The strength of this study is the economical and easily available blood test that can be done and followed to limit the complications of pregnant women and the newborns. Although this study has pointed towards the relationship of platelet parameters and gestational diabetes but the limitations of this study due to limited number of study participants needs to be overcome by further research in this area.

CONCLUSION

GDM leads to increased maternal and fetal morbidity and mortality. The platelet indices MPV and PDW showed statistically significant relationship with GDM in this study. These indices which are easily available can be used for the early intervention and prevention of complications to improve maternal and fetal outcomes.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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