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Platelet Profile of Cord Blood in Infants of Diabetic Mothers

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ABSTRACT

Background: Infants of diabetic mothers (IDM) are prone to a number of immediate neonatal complications when compared to the babies born to normal mothers. Diabetes mellitus is a risk for the health of both pregnant women and her infant. Its unfavorable effects start in utero and continue after birth. It is known that gestational diabetes mellitus (GDM) increases oxidative stress and decreases antioxidant enzyme activities. Maternal glycemic control has been one of the parameters that determines the occurrence of these problems. In present study we aimed to investigate cord blood mean platelet volume (MPV) of infants of diabetic mothers (IDM). **Method:** Forty pregnant women with GDM between 37 to 40 gestational weeks were enrolled as study group together with 40 healthy pregnant women as a control group. The two groups were compared in terms of demographics parameters like weight, length, and head circumference of babies. Two milliliters of umbilical venous blood were obtained to study platelet parameters and MPV levels. **Results:** There was statistically significant increase in MPV ($p < .05$) in IDM as compared with control group.**Conclusion:** MPV is useful for representing the potential oxidative stress of IDM. The mean platelet volume and other platelet parameters may significantly aid in identification of diabetic pregnants at risk for vascular complications.

Keywords: *Cord blood, Gestational diabetes mellitus, Mean platelet volume, Morbidity, Oxidative stress.*

INTRODUCTION

Diabetes mellitus is the commonest endocrinal disorder,causing considerable morbidity and mortality to both mother and fetus [1]. Its incidence is increasing among urban population at an alarming rate, due to stress inducing life style. It involves derangement of carbohydrate, fat and protein metabolism characterized by hyperglycemia, hyperlipidemia and negative nitrogen balance [2].

The term "Infant from diabetic mother" (IDM) refers to those from pregnancies complicated by diabetes mellitus (DM type 1, type 2) or gestational diabetes mellitus(GDM) [3].

Prevalence of GDM is increasing worldwide and it is reported to range from 1% to 14% in the literature [4]. Increasing age and obesity are the risk factors. Diabetes mellitus in pregnancy is associated with increased rate of complications like preeclampsia, polyhydramnios, fetal macrosomia and operative delivery. Early diagnosis and treatment is important for prevention of complications.

Newborns from diabetic mothers are more frequently born prematurely, large for the gestational age and with risk of respiratory distress syndrome (RDS) and subsequently, exposed to a higher risk of perinatal distress, hypoxia, metabolic stress and hematologic alterations[5]. Probably, classically described modifications such as myocardial hypertrophy, accelerated growth, polycythemia, modified blood rheology and cerebral perfusion found in the intra-uterine life are due to the chronic adaptation mechanisms to the continuous metabolic stress of hyperglycemia[6,7]. Hypoglycemia,hypocalcemia, hyperbilirubinemia and polycytemia are some of the complications seen in the IDM. Besides increase in perinatal mortality, there is increased risk of developing obesity , impaired glucose tolerance and DM in childhood period [8].

Literature about increased oxidative stress and decreased antioxidant enzyme capacity in pregnant women with GDM is limited[9].These changes may be associated with increased risk of vascular disease and

venous thromboembolism[10-12].

Patients with DM show altered platelet function, including decreased nitric oxide synthase activity and increased peroxynitrite production[10-12]. Platelet volumes are direct indicators of increased platelet synthesis[13]. In normal pregnancies, there is a small increase in platelet aggregation.This is compensated for by increased platelet synthesis and, consequently, increased mean platelet volume (MPV)[12-15]. These changes in platelet volumes may be more sensitive than platelet numbers as a measure of a platelet morphology and altered platelet function[16-18].

The present study was designed to assess and compare laboratory findings of platelet profile in healthy pregnant women and diabetes patients. Our aim is to investigate cord blood MPV levels as a sign of oxidative stress in the IDM.

MATERIALS AND METHOD

Present study was conducted at Department of Physiology in Kamineni Institute of Medical Sciences, Narketpally, Nalgonda District, Telangana in collaboration with Department of Obstetrics and Gynecology. It was a prospective case control study conducted in 80 newborns during August 2015 to September 2016 over a period of 14 months. The approval of ethics committee was obtained.

They were divided in to 40 Diabetic women with singleton pregnancy between 37-40 gestational weeks (study group) and 40 age matched healthy pregnant women as control group. Patients who refused to participate, those suffering from cardiovascular disease, thyroid disorder, anaemia, toxemia of pregnancy and multiple gestation were excluded.

All subjects were informed in detail about aim, objectives and procedure of the study and written consent was taken for conduct of study.

Maternal weight, height and body mass Index (BMI) was calculated. Their blood glucose and HbA1c levels were measured.

APGAR scores at 1st minute and 5th minutes, birth weight & length was recorded and Ponderal index (PI) was calculated. It is a weight-height related parameter used to predict fetal growth pattern in small-for-gestational age infants and for large-for-gestational age (LGA) infants . It is calculated using formula: PI = weight (g) x 100/(height,incm^3) [19].

After resection of the umbilical cord, the cord stump remaining on the placenta was cleaned and 2ml of blood was collected and analyzed for Platelet profile (Platelet count, Mean platelet volume (MPV) Platelet distribution width (PDW) using automated hematological analyzer.

Statistical Analysis

Data were recorded using the SPSS 15.0 statistical software package (SPSS Inc., Chicago, IL, USA). Descriptive data was expressed as Mean±S.D and student's t- test was used for comparison between the groups. p-value <0.05 was considered to be significant.

RESULTS

Table 1: Maternal characteristics of case and control groups (N=80)

S.No	Characteristics	Diabetic pregnant women (n=40) Mean±SD	Normal pregnant women (n=40) Mean±SD	p-value
1	Age of mother(yrs)	30.6 ±4.1	26.8±2.2	<.05
2	Gestation at delivery (wks)	38.1±1.1	38.5±1.2	>.05
3	Body mass Index (kg/ m2)	26.8±2.5	22.1±1.4	<.05
4	HbA1c	5.9± 1.1	4.8±0.5	<.05

It represents maternal age, BMI and HbA1c was significant

Table 2: Apgar score assessment at birth (N=80)

S.No	Apgar score		Newborn of Diabetic mother (n=40)	Newborn of healthy mother (n=40)
1	Apgar 1 min	8-10	24	27
		5-7	10	12
		<5	6	1
2	Apgar 5min	8-10	28	31
		5-7	11	9
		<5	1	-

Apgar score assessment at birth did not show any significant difference between two groups

Table 3: Anthropometric parameters of newborn at birth (N=80)

S.No.	Characteristics	Newborn of Diabetic mother (n=40) Mean±SD	Newborn of healthy mother(n=40) Mean±SD	p-value
1	Neonate Birth weight (gms)	3010.2±520.5	2950.7±550.8	>.05
2	Poderal Index (g/cm3)	2.4±0.2	2.5±0.2	>.05

Demographic characteristics of the newborns between two groups which was not significant.

Table 4: Cord blood Platele profile in neonate of diabetic and non- diabetic mothers (N=80)

S.No	Parameters	Newborn of Diabetic mother (n=40) Mean±SD	Newborn of healthy mother (n=40) Mean±SD	p-value
1	Platelet count Lakh/ mm^3	1.98±7.96	2.44±6.83	<.05
2	MPV fL	8.54±1.68	7.43±0.47	<.05
3	PDW%	13.32±4.47	13.32±0.85	>.05

Platelet count was significantly higher in control group than in diabetic group. MPV was significantly higher in IDM group. There was no significant difference in Platelet distribution width (PDW) between two groups.

DISCUSSION

Pregnancy is a physiologically increased stress condition and it is aggrevated in complicated pregnancies. Kharb[20] claimed that low insulin sensitivity is the cause of the oxidative stress and leads to free radical production. Because GDM markedly triggers oxidative stress and MPV directly shows the response of the thrombocytes to the stress, MPV may be used as a marker for oxidative stress.

We found a significant elevation in the cord blood MPV in IDM then control group. It is effective marker of blood glucose[1,2]. It was found to be higher in diabetic and pre-diabetic with impaired fasting glucose[21,22]. However, after the blood glucose was reduced, there was a significant decrease in these values[1,17].

MPV is a marker of platelet function and activation[1,2]. Patients with high MPV had low platelet counts. It has been reported that platelet survival is shorter in diabetic patients[21]. This may be explained by variables such as platelet production and mean platelet survival. The platelet distribution width displays a good correlation with the MPV[1,2].

Patients with diabetes have increased platelet activation compared to non-diabetic [1,17]. Their hyperactivity may potentially have a role in the development of vasculopathies[11-15]. It is accompanied by increased thromboxane synthesis and/or decreased prostacycline production. Larger platelets are both more reactive and aggregable[23].They contain denser granules, secrete more serotonin and b-thromboglobulin, and produce more thromboxane A2 than smaller platelets. This relates to a relationship between platelet function and micro and macrovascular complications of diabetes mellitus [1,2,21].-

The platelet count is slightly lower in pregnant than in non-pregnant women[24]. It also decrease with increase in duration of pregnancy [25]. Normally interleukins, specially IL-6 is required to convert uncommitted stem cell to committed stem cells of megakaryocytic series. The IL-6 in neonate of diabetic mother loses its hemopoietic potency due to immune-modulatory effect of diabetic maternal IL-6 resulting in decreased platelet count. It is also attributed to fetal hypoxia due to placental abnormality in diabetic group.

CONCLUSION

Mean Platelet volume and other platelet-related parameters is a simple procedure, available in most hospital laboratories. It is useful for representing the potential oxidative stress of IDM. Hence, there is need to creat more awareness by pre-pregnancy counselling of know diabetics as well as screening for potential gestrational diabetics. MPV may be used as a marker for follow-up of diabetic patients

Limitation

It was performed in a single hospital and limited number of patients, therefore sample may not be representative of all Indian women. We recommend a cross-sectional multicentric study to confirm results of present study & to define possible relationship between platelet profile in diabetes mellitus in pregnancy.

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Ethical Clearance- Taken from Institutional Ethical Committee

Conflict of Interest: Nil

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