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Platelet Indices in small for gestational age term newborns

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Abstract

Background & Objectives: *Our study aimed to compare the Platelet Indices in full term small for gestational age newborns as compared to full term appropriate for gestational age newborns.*

Materials and Methods: *We included 30 term small for gestational age newborns as cases and 30 term appropriate for gestational age newborns as controls. Platelet Indices (Total Platelet Count [TPC], Mean Platelet Volume [MPV], Platelet Distribution Width [PDW], Plateletcrit [PCT], Platelet Large Cell Ratio [PLCR]) were estimated in samples taken on LD 1-3 of the cases and controls.*

Results: *Small for gestational age newborns showed a decreased Total Platelet count [TPC] (p 0.412) and Plateletcrit [PCT] (p 0.566) as compared to the controls. Mean Platelet Volume (MPV), Platelet distribution width (PDW) and Platelet large cell ratio (PLCR) were increased in small for gestational age term newborns as compared to the controls; with p values of 0.592, 0,045 and 0.269 respectively. The increase in PDW (Platelet distribution width) was found to be statistically significant.*

Interpretations & Conclusions: *Small for gestational age term newborns have many hemostatic abnormalities as compared to appropriate for gestational age term newborns. The estimation of Platelet indices might help in predicting the risk, severity of bleeding complications in such newborns and help in their timely management.*

Keywords: *hemostatic, gestational, indices.*

Introduction

Platelets are blood particles which help in hemostatic function, inflammatory process, microbial host defence and wound healing.[1,2] Complete blood count (CBC) is one of the most commonly performed laboratory test.[3] Nowadays, new indices related to platelets are provided by hematology analyzers.[4] Platelet indices (PI)-Total platelet count (TPC), Mean Platelet Volume (MPV), Platelet distribution width (PDW), Plateletcrit (PCT) and Platelet large cell ratio (PLCR) are a group of platelet derived

parameters obtained as a part of automatic complete blood cell count and are biomarkers of platelet activation.[4]

As is well known, India has a huge burden of small for gestational age infants.[5-7] Based on available data, about 2.3-10% of all infants are born Small for gestation(SGA).[8] SGA is defined as a newborn whose birth weight or birth crown-heel length is 2 standard deviations (-2SD) below the mean for the gestational age based on data from a reference population.[9] Causation of SGA is multifactorial including fetal, maternal and placental factors. IUGR [Intra-uterine growth retardation] is the commonest cause of SGA in Indian babies.[10]

IUGR being an important clinical problem, evaluation and interpretation of platelet parameters takes on particular value in such newborns.

Our study aimed to determine the platelet indices in full term SGA newborns as compared to full term Appropriate for gestational (AGA) newborns. We tried to find out whether pregnancy complicated by IUGR affects the platelet indices.

Materials and Methods

Our study was conducted at NICU, Mahila Chikitsalaya, SMS Medical College and Hospitals, Jaipur, Rajasthan from March 2019 to December 2019. We included 30 term small for gestational age newborns as cases and 30 term appropriate for gestational age newborns as controls.

Cases

Inclusion Criteria

1. Term small for gestational age newborns with gestation between 38-41 weeks and birth weight 2 standard deviations below the mean for the gestational age.
2. No antenatal risk factors nor clinical or laboratory evidence of sepsis.

Exclusion Criteria

1. Term small for gestational age newborns with congenital malformations.
2. Term small for gestational age newborns with antenatal risk factors, clinical and laboratory evidence of sepsis
3. Term small for gestational age newborns of mothers with any congenital intrauterine infections and mothers who during last 10 days of gestation received anti-platelet drugs.

Controls

Term (gestation between 38-41 weeks), appropriate for gestational age newborns who were admitted for neonatal jaundice or observation. This group also excluded those with congenital malformations and with proven sepsis.

About 2 ml blood was taken in an EDTA vial on day 1-3 of life and the platelet indices were taken from an automated hematology analyser machine in the same hospital.(SYSMEX JAPAN, model XT 1800i, working on fluorescence flow cytometry principle).

Mothers of the eligible newborns were explained about the nature and purpose of the study and their informed consent was taken to participate in the study.

A detailed antenatal and natal history was taken of the eligible newborns along with a thorough general, anthropometric and systemic examination.

A clearance from institutional ethical committee was taken for the conduct of study.

The results were analysed statistically using the chi-square test. It was considered statistically significant if p value was <0.05 and highly significant with a p value<0.001.

Results

Table I: Platelet indices in Small for gestation age term newborns

PARAMETER	GROUP	MEAN±SD	t-Value	P-Value*
1.MPV	SGA	10.15±0.70	0.539	0.592
	AGA	10.05± 0.76		
2.PLCR	SGA	25.52 ±4.65	1.11	0.269
	AGA	24.56± 4.98		
3.PCT	SGA	0.23 ±0.11	0.576	0.566
	AGA	0.24± 0.08		
4.PDW	SGA	12.24± 2.34	2.027	**0.045**
	AGA	11.49± 1.71		
5.TPC	SGA	2.27± 1.08	0.823	0.412
	AGA	2.41± 0.78		

*Chi-Square test

SGA –Small for gestational age
AGA – Appropriate for gestational age
MPV – Mean platelet volume
PLCR – Platelet large cell ratio
PCT - Plateletcrit
PDW – Platelet distribution width
TPC – Total platelet count

The Platelet Distribution Width (PDW) in our cases was increased (12.24+/- 2.34) as compared to the controls (11.49+/-1.71).This difference was statistically significant.

Discussion

Platelet indices are a group of platelet derived parameters obtained as a part of the automatic complete blood count.[11] Little is documented in the literature regarding the clinical interpretation of these parameters.[12]

Platelet indices are biomarkers of platelet activation.[11] Important of these are TPC (Total Platelet Count), MPV (Mean Platelet Volume), PDW (Platelet Distribution Width, PLCR (Platelet Large Cell Ratio), PCT (Plateletcrit).

Newborns born small for gestation are prone to thrombocytopenia in the first week of life.[13]A study by Meberg, Halvorsen and Orstvak from Oslo in 1977[13] found that newborns with a birth weight <10th percentile had low platelet count in first days of life. They speculated that this was the result of placental insufficiency induced chronic hypoxia in utero.

In 1983, Shuper et al from Israel reported 14 SGA newborns with low platelet counts.[14]

Our study also shows a low platelet count in SGA newborns which is in correlation with the above studies although not statistically significant.

MPV (Mean Platelet Volume) is the best known of these platelet parameters. It is an analyser – calculated measure of thrombocyte volume and measure in femtolitres (fl). It is a marker of platelet function and activation.[14,15] Increased MPV indicates increased platelet diameter which can be used as a marker of production rate and platelet activation. Increased MPV can be expected in "regenerative" thrombocytopenia, i.e. that caused by increased platelet loss, destruction, or utilization of platelets and accompanied by increased production of platelets by marrow (megakaryocytic hyperplasia)[14,15] Increased MPV is observed during periods of platelet production.[16,17] In our study also MPV of the SGA newborns was increased as compared to the control group as is stated above but it was not statistically significant.

Platelet count and MPV correlate with gestational age and platelet count also correlates with birth weight.[18]

PDW (Platelet Distribution Width) is an indicator of volume variability in platelet size and is measured in percentage (%). PDW is increased in the presence of platelet anisocytosis[19].It directly

measures variability in platelet size, changes with platelet activation and reflects the heterogeneity in platelet morphology.[20,21].In our study PDW of the SGA newborns was increased as compared to those in controls which correlates with increased anisocytosis of platelets which goes with the megakaryocytic hyperplasia as mentioned above. This came out to be statistically significant (p 0.045).

In our study, both MPV and PDW are increased as compared to the controls. It is probably due to the increased production of young and activated platelets. The increase in MPV could also be due to the inverse relationship to the platelet count. Vagdatli et al showed that simultaneous increase of MPV and PDW is seen during platelet activation.[21]Similar findings were also noted by Wasiluk et al.[22]

Platelet Large Cell Ratio (PLCR) is an indicator of larger (>12fL) circulating platelets presented in percentage (%). The normal range is 15-35%. It has also been used to monitor platelet activity.[23] PLCR is inversely related to platelet count and directly related to PDW and MPV. PLCR if properly utilized can be a good aid in the differential diagnosis of conditions associated with abnormal platelet counts. In our study also the cases had increased PLCR as compared to the controls although not statistically significant.

Plateletcrit (PCT) is the volume occupied by platelets in the blood, expressed as a percentage (%).[24-6]Under physiological conditions, the amount of platelets in the blood is maintained in an equilibrium state by regeneration and elimination. The normal range for PCT is 0.22-0.24%.[24-7].In healthy subjects, platelet mass is closely regulated to keep it constant, while MPV is inversely related to platelet counts.[28,29] The study done by Wasiluk et al also showed a decrease in PCT in the cases as compared to the controls.[22] Our study also shows a decreased Plateletcrit in the SGA newborns as compared to the AGA control group but this was not statistically significant.

Conclusion

Small for gestation age newborns are associated with hemostatic abnormalities. Platelet indices may provide useful information regarding thromboembolic status in newborns. They may thus prove to be a useful marker for identification of hemostatic disorders in newborns and predict the development of complications at an early stage.

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