Study of Complete Haemogram and Iron Profile From Cord Blood of Newborn with Respect to Primigravida, Multigravida and Apgar Score

Madhumita Mondal¹ · Swapan Kumar Sinha² · Moumita Sengupta¹ ·
Debdas Bose² · Sudip Saha³ · Utpal Chaudhuri⁴

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Abstract Study of different parameters of cord blood usually reflects neonatal health status. One of the widely used system for assessing neonatal health is APGAR score. It is assessed at 1 and 5 min from baby's birth. Immediate medical care may improve 5 min score of neonate who showed poor score at 1 min. The main objective of this study is to establish whether any correlation exists between complete hemogram and iron profile with APGAR score and gravid of mother. Cord blood was collected from 96 new born, delivered vaginally, mothers having no chronic medical disease. Different parameters of complete hemogram were assessed along with iron profile and statistical analysis was done by Graph pad Instat3 soft ware. Statistically significant correlation exists between APGAR score (5 min) and MCV ($p = 0.005$), MCHC ($p = 0.016$), nRBC ($p = 0.002$), platelet count ($p = 0.001$), RDW ($p = 0.001$). Statistically weak correlation exists between TLC ($p = 0.08$). Comparing complete blood count with gravid of mother by unpaired t test significant correlation was obtained for HCT ($p = 0.035$) and RDW ($p = 0.03$). Apgar score and complete hemogram from cord blood are both non-invasive procedure which help us to assess fetal wellbeing as well as requirement of immediate

management. Further more studies are essential to establish the relationship.

Keywords Gravida · APGAR score · Complete hemogram

Introduction

In 1952, Virginia Apgar, proposed a scoring system to assess the condition of new born during the first minutes of life, and to evaluate anaesthetic and obstetric practices. She proposed five objectives and easily measured clinical signs: skin colour, pulse rate, reflex irritability grimace, activity, respiratory effort [1] on a scale from zero to two. The five values are then summed up to obtain a score from zero to 10. The test is typically performed within 1 min and then again at 5 min after the baby is born. When the score is between 7 and 10 then there is no depression and the infants are essentially normal. When the score is between 4 and 6 then there is mild depression and between 0 and 3 severe depression. A score on the 1 min test may show that the neonates requires medical attention but does not necessarily indicate a long term problem, particularly if the score improves at the 5 min test. Maganaro and colleagues suggested that the 5th min Apgar score is useful for immediate clinical assessment and care of the neonate [2].

Gravida denotes a pregnant state both present and past, irrespective of period of gestation and interval between two conception. Parity denotes a state of previous pregnancy beyond the period of viability. So gravid and parity both refer to pregnancies and not to babies. Multigravida is one who has previously been pregnant. She may have aborted or have delivered a viable baby. Elderly primigravida are women having their first pregnancy at or above the age of 30 years.

✉ Madhumita Mondal
rgkarmadhumita@gmail.com

¹ Department of Pathology, IPGMER, Kolkata 700020, India

² Department of Pathology, Medical College Hospital, Kolkata 700073, India

³ Department of Gynaecology and Obstetrics, Medical College, Kolkata 700073, India

⁴ Institute of Hematology and Transfusion Medicine, Medical College, Kolkata 700073, India

Serum iron, Total iron binding capacity (TIBC), ferritin are the different biochemical parameters which are required to proof iron deficiency anemia. Hemoglobin (HB) and hematocrit (HCT) levels are tested when anemia is suspected. Serum hemoglobin measures the level of free (outside red blood cells) hemoglobin in the blood while hematocrit is the measurement of the percentage of red blood cells in the whole blood. It is important determinant of anemia (decreased), dehydration (elevated) or possible over hydration (decreased). The test are usually conducted in conjunction with a complete blood count. Of these other test values the mean (average) corpuscular volume (MCV) can also indirectly help to understand iron metabolism as MCV measures how big the red blood cells are. When a deficiency in iron occurs not enough hemoglobin is made. This lead to somewhat reduced rate of red blood cell production and the red blood cells are often smaller than normal (microcytic) and paler than normal(hypochromic). Reticulocytes are immature non nucleated red blood cell that contain RNA. It reflects accelerated nature of erythropoiesis.

Materials and Methods

A prospective study was done among newborns delivered per vaginally in the Department of Gynaecology and Obstetrics, Medical College, Kolkata. Detail clinical history, written consent and physical examination of mother was done to note the gravida and to find out the presence of any medical and surgical complications.

Cord blood from 96 normal deliveries were collected from placenta of mothers who have given the consent, in clotted and EDTA vials. Blood in the EDTA vial was used for obtaining the complete blood counts and reticulocyte count using auto analyser, peripheral smear was also made. From the clotted blood serum is separated. With the help of semi auto analyser serum iron and TIBC is estimated. Serum ferritin was estimated by ELISA method. Apgar score was assessed by a trained physician at 1st and 5th min after birth but 5th min score was taken in account.

Total 96 new born were assessed for Apgar score and cord blood were collected after vaginal delivery. The maximum age of mother was 36 years and minimum was 17 years of which 14 mothers were <20 years age and 10 had age of >30 years. Sixty (62.5%) mothers had HB level <11 g% ranging from 6.5 to 13% with a mean concentration of 10.66 g%. Sixty six point (66.7%) of the newborns were male and 33.3% were females. Birth weight of new born babies ranged from 1.52 to 3.6 kg with a mean of 2.75 kg. Sixty eight percent (68%) babies had birth weight more than equal to 2.5 kg. Haemoglobin concentration of the new born babies ranged from 13 to 19.1 g% with a

mean of 15.4 g% and SD of 1.461. Approximately 40% (39.6%) of the new born babies had haemoglobin concentration of 14.1–15 g%. HB level >16 g% was seen in 10.4% of the newborns (10 cases). None of the newborn had HB level <13 g%.

Inclusion criteria:

If co-operation from the patient is available and relevant history is available from the patient.

Exclusion criteria:

If mothers have hemorrhage in early pregnancy or antepartum hemorrhage, multiple pregnancy, hypertensive disorder in pregnancy, suffering from any debilitating disease like tuberculosis, HIV etc., are excluded from study. Cases without proper clinical history are also not included in this study. Mean, standard deviation, of the data are derived. ANOVA (one way analysis of variance) test and unpaired t test with Graphpad Instat3 soft ware done to reveal any significant correlation. The statistical significance was set at 5% ($p < 0.05$).

Results

Approx 40% of mothers were primigravida and rest multi gravida (Table 1). Twelve (12.5%) babies showed severe depression, eighteen babies (18.8%) showed mild depression and the rest showed no depression in Apgar score (Table 2). Comparing the complete blood count parameters with respect to Apgar score by ANOVA (one way analysis of variance) test we found significant 'p' values for MCV ($p = 0.005$), MCHC ($p = 0.016$), nRBC ($p = 0.002$), platelet count ($p = 0.001$), RDW ($p = 0.001$). Statistically weak correlation exists for TLC ($p = 0.08$) and serum ferritin (0.09) (Table 3). Comparing complete blood count with gravid of mother by unpaired t test significant

Table 1 Distribution of mothers with respect to gravid

Gravida	Frequency	Percent
Primi	38	39.6
Multi	58	60.4
Total	96	100

Table 2 Distribution of new born babies with respect to APGAR score (5 min)

Apgar score	Frequency	Percent
0–3 (severe depression)	12	12.5
4–6 (mild depression)	18	18.8
7–10 (no depression)	66	68.8
Total	96	100

Table 3 Comparison of APGAR score (5 min) with respect to different parameters

Parameters	Apgar score			
	Score 0–3	Score 4–6	Score 7–10	<i>P</i> value
T RBC count	4.63 ± 0.183	4.464 ± 0.510	4.57 ± 0.4599	0.5427
HB	15.16 ± 1.596	15.56 ± 1.579	15.39 ± 1.421	0.7664
HCT	48.35 ± 3.68	47.67 ± 5.98	44.84 ± 7.382	0.1183
MCV	108.23 ± 7.55	106.07 ± 5.01	97.98 ± 11.32	0.0005
MCH	33.93 ± 3.219	34.68 ± 0.976	33.76 ± 2.43	0.3361
MCHC	31.33 ± 2.04	32.75 ± 1.344	34.71 ± 4.82	0.0164
NRBC	6.66 ± 1.77	6.22 ± 1.66	5.15 ± 1.14	0.0002
PLT count	2.13 ± 0.40	2.4 ± 0.712	2.05 ± 0.708	0.0001
TLC	16.51 ± 10.03	16.33 ± 6.376	13.63 ± 4.103	0.0827
RETIC count	4.66 ± 0.69	4.36 ± 1.092	4.5 ± 0.814	0.6417
RDW	19.98 ± 1.80	18.83 ± 1.26	18.08 ± 1.85	0.0018
SER.IRON	134.53 ± 14.59	134.54 ± 64.599	122.83 ± 28.69	0.358
TIBC	386.5 ± 61.28	369.33 ± 35.74	389.38 ± 59.30	0.4061
Ferritin	199.9 ± 190.91	106.3 ± 77.84	119.52 ± 120.85	0.0958

Table 4 Comparison of different parameters with respect to gravid of mothers

Parameters	Primi (M ± SD)	Multi (M ± SD)	<i>p</i> value
T RBC count	4.5489 ± 0.459	4.571 ± 0.4389	0.8134
HB	15.4158 ± 1.451	15.382 ± 1.48	0.9144
HCT	47.631 ± 5.536	44.6207 ± 7.446	0.0354
MCV	103.24 ± 8.512	99.1793 ± 11.856	0.0715
MCH	33.894 ± 2.86	34.0 ± 1.961	0.8311
MCHC	33.01 ± 3.86	34.5276 ± 4.45	0.0889
NRBC	5.421 ± 1.287	5.6207 ± 1.554	0.5124
PLT count	2.181 ± 0.777	2.101 ± 0.624	0.5647
TLC	14.789 ± 4.884	14.3069 ± 6.161	0.6855
RETIC count	4.6 ± 1.034	4.4379 ± 0.7155	0.3661
RDW	18.957 ± 2.109	18.1483 ± 1.507	0.0307
SER.IRON	122.15 ± 23.171	129.33 ± 43.645	0.3539
TIBC	386.75 ± 54.775	384.29 ± 57.148	0.834
Ferritin	114.35 ± 90.854	135.44 ± 145.87	0.4286

correlation was obtained for HCT ($p = 0.035$) and RDW ($p = 0.03$) (Table 4). All the calculations were done in Graphpad Instat3 soft ware.

Discussion

Studies were carried out to establish relation between Apgar score of babies delivered by anemic and non-anemic mothers, showing statistical significant correlation [3–5].

Studies were carried out to establish relationship between Apgar score and method of delivery (vaginal, caesarean section), which was not statistically significant. However, premature newborns, those with low birth weight

and maternal preeclampsia had low Apgar scores, and their statistical differences were significant [6].

Studies showed the rate of birth of infants with Apgar scores <8 significantly increased among women with HB <10.5 g/dl or HB >13.2 g/dl in the second trimester [7].

Studies showed no correlation between Apgar score with maternal age, parity, and fetal gender; however, there was a significant correlation between gestational age and Apgar score. Apgar score less than eight in neonates born before 40 weeks of gestation was more than others [4].

Studies showed no correlation between Apgar score both 1 and 5 min with cord blood glucose level. The fluctuations in the maternal glucose levels are weekly associated with the glucose level in the cord blood [8].

Studies showed mean umbilical artery blood ph in high risk mothers was significantly lower than in low risk mothers. Mean Apgar scores at 1 and 5 min were significantly lower in the high risk mothers than in low risk mothers. According to the Kendal correlation coefficient there was no significant correlation between Apgar score at 1 and 5 min and umbilical cord ph in low risk group. But in high risk group there was significant correlation between Apgar score at 1st and 5th min and umbilical cord ph [9].

Our study was carried out to find any relationship between complete hemogram and Apgar score also between hemogram and gravid of mothers. Comparing the complete blood count parameters with respect to Apgar score by ANOVA (one way analysis of variance) test we found significant p values for MCV ($p = 0.005$), Mean corpuscular haemoglobin concentration (MCHC) ($p = 0.016$), nucleated RBC (nRBC) ($p = 0.002$), platelet count ($p = 0.001$), Red cell distribution width (RDW) ($p = 0.001$). Statistically weak correlation exists for total

leucocyte count (TLC) ($p = 0.08$) and serum ferritin (0.09) (Table 3). Comparing complete blood count with gravid of mother by unpaired t test significant correlation was obtained for HCT ($p = 0.035$) and RDW ($p = 0.03$) (Table 4).

Conclusion

Apgar score assesses the immediate fetal health condition so also cord blood hemogram and iron profile which help us to estimate iron deficiency state. The study was carried out to establish a correlation among them. Gravid of mother is also an influencing factor on new borns health. Comparison was done between complete hemogram and iron profile with gravid of mothers. Few factors (HCT, RDW) showed significant correlation. Further elaborated studies were required to proof more.

Compliance with Ethical Standards

Conflict of interest None.

Informed Consent Informed consent was obtained from all individual participants included in the study.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of

the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

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