

CORD BLOOD HAEMOGRAM IN HEALTHY NEWBORN

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ABSTRACT

BACKGROUND

The complete blood count parameters included in the present study are: Haemoglobin, Red cell count, Haematocrit, Mean corpuscular volume, Mean corpuscular Haemoglobin, Mean corpuscular haemoglobin concentration, Red cell distribution width, White blood cell count, Platelets, Lymphocytes, Neutrophils, Mid cells (Eosinophils, Basophils, Monocytes). A full blood count is one of the most frequently requested for investigations in the assessment of health status of an individual. Because it is simple, cheap, fast to obtain and is a reliable indicator of health. Abnormally high or low counts may indicate the presence of many forms of disease and hence the blood counts can provide an overview of an individual general health status.

MATERIALS AND METHODS

Complete blood count is performed by an automated analyser. All blood counts include a CBC count and leukocyte differential count, but modern analysers provide much more in addition. The blood is well mixed and placed on a rack in the analyser. This instrument has flow cells, photometers and apertures that analyse different elements in the blood. The cell counting component counts the numbers and types of different cells within the blood. The reports are printed out or sent to the computer for review. The study was conducted at five private hospitals in Kurnool. Babies delivered in five private hospitals affiliated to our hospital for neonatal services attended by DNB resident, Kurnool, Andhra Pradesh. 900 cord blood samples of healthy newborns (full term newborns of which 477 are male children and 423 are female children), who are included in the inclusion criteria, in the duration period of study period of 1 year from May 2013- April 2014.

RESULTS

Comparison of various red cell parameters and white blood parameters in cord blood of newborns between Vaginal and caesarean section, male and female neonates is given below.

CONCLUSION

Full blood counts parameters from neonatal cord blood are summarized as follows: The mean haemoglobin level is 14.99 ± 1.63 g/dl, Mean Haematocrit value is $46.8 \pm 8.04\%$, mean MCV is 101.09 ± 6.12 fl, mean RDW is $13.1 \pm 1.75\%$, mean WBC is $7.56 \pm 2.19 \times 10^9$, mean neutrophils count is $54.83 \pm 9.56\%$, a mean lymphocytes count is 40.22 ± 6.52 , mean MID value is $6.70 \pm 2.38\%$ and a mean platelet count is $271.64 \pm 76.1 \times 1000$.

KEYWORDS

Haemoglobin, Red Cell Count, Haematocrit, Mean Corpuscular Volume, Mean Corpuscular Haemoglobin, Mean Corpuscular Haemoglobin Concentration, Red Cell Distribution Width, White Blood Cell Count, Platelets, Lymphocytes, Neutrophils, Mid Cells.

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BACKGROUND

The human body is primarily made up of water and cells. Many of the cells group together to form tissues. Some specialized cells move throughout the body by circulation. The complete blood count, or CBC, is a lab test that provides information about these circulating cells. The complete blood count can help in many ways: Provide basic information about health, detect a health condition before you have any

symptoms, Confirm that a health condition exists, Identify the causes of your symptoms, Find out if your medicine is working, Rule out a disease, Establish a baseline that can be used for comparison with future test results. CBC is one of the commonly used laboratory examinations for evaluating the clinical condition of neonates. Repeat punctures may be necessary for blood collection which may bring unnecessary complications such as thromboembolism, arterial spasm and gangrenous changes.¹ In these conditions, Cord blood provides an alternative choice for just born babies if blood sampling is necessary.² Reference value is defined as the value obtained by observation or measurement of a particular type of quality or an individual belonging to the reference group.³ Umbilical cord blood is blood that remains in the placenta and in the attached umbilical cord after childbirth. It is a rich source of haematopoietic stem cells. It is collected from the umbilical cord vein attached to the

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placenta after the umbilical cord has been detached from the newborn. The cord blood has some disadvantages such as delayed neutrophil and platelet engraftment, immune reconstruction and insufficient cell dose for larger recipients. checking CBC and WBC differential count is essential before cry preserving the cord blood units. Therefore, the normal reference values of CBC is important in clinical practice.

Aims of the Study

1. To study the local reference haematological values of umbilical cord blood in healthy babies and compare them with other similar studies.
2. To study the influence of type of delivery on haematological parameters.
3. To study the influence of gender of newborn on haematological parameters.

Inclusion Criteria- Babies of:

1. Birth weight greater than or equal to 2500 grams.
2. Gestation age greater than or equal to 37 weeks.
3. Apgar score greater than or equal to 7 at 1 minute and 5 minutes.
4. No postnatal illness such as Respiratory distress, Sepsis, Hypoglycaemia, Polycythaemia or any condition requiring admission in neonatal unit.

Exclusion Criteria

1. Consanguinity
2. Unfavourable past history before pregnancy like heart diseases, thyroid disorders etc.
3. Prenatal complications such as Hepatitis B, Hepatitis C, HIV, Syphilis infection, PIH, and other chronic diseases.
4. Natal Complications such as Multifetal pregnancy, Maternal fever $>38^{\circ}\text{C}$
5. Postnatal complications such as Gestational age less than 36 weeks, Low birth weight less than 2.5 kgs, Twin pregnancies, Premature rupture of membranes more than 24 hours.
6. Any other prenatal, natal and postnatal complications.

MATERIALS AND METHODS

The study was conducted at five private hospitals in Kurnool. Babies delivered in five private hospitals affiliated to our hospital for neonatal services attended by DNB resident, Kurnool, Andhra Pradesh. 900 cord blood samples of healthy newborns (full term newborns of which 477 are male children and 423 are female children), who are included in the inclusion criteria, in the duration period of study period of 1 year from May 2013-April 2014. After informed consent from the parents, the umbilical cord blood sample is collected from healthy newborns who met the inclusion criteria at the time of delivery during the period of 1 year at the five affiliated private hospital for neonatal services attended by DNB residents. The collected cord blood sample will be analysed for the complete haemogram by automatic analyser- alpha swelab. Complete blood count is performed by an automated analyser. All blood counts include a CBC count and leukocyte differential count, but modern analysers provide much more in addition. The blood is well mixed and

placed on a rack in the analyzer. This instrument has flow cells, photometers and apertures that analyze different elements in the blood. The cell counting component counts the numbers and types of different cells within the blood. The reports are printed out or sent to the computer for review.

RESULTS

A total of 900 healthy newborns of which 477 (53%) are male children and 423 (47%) female children were enrolled in this cross-sectional study conducted at five private hospitals in Kurnool, Andhra Pradesh from May 2013 to April 2014.

Parameter	Range	Mean \pm SD
Haemoglobin	12-18	14.99 \pm 1.63
Red cell count	4-5.5	4.71 \pm 0.5
Haematocrit	35-60	46.8 \pm 8.04
MCV (fl)	90-110	101.09 \pm 6.12
MCH (pg)	30-45	37.97 \pm 4.53
MCHC (gm/dl)	28-36	31.98 \pm 2.70
RDW (%)	10-16	13.1 \pm 1.75
WBC	4-11	7.56 \pm 2.19
Neutrophils (%)	40-70	54.83 \pm 9.56
Lymphocytes (%)	30-50	40.22 \pm 6.52
MID (%)	3-10	6.70 \pm 2.38
Platelets	150-400	271.64 \pm 76.1

Table 1. Full Blood Count Parameters from Neonatal Cord Blood are Summarized as follows

Full blood counts parameters from neonatal cord blood are summarized as follows: The mean haemoglobin level is 14.99 ± 1.63 g/dl, Mean Haematocrit value is $46.8 \pm 8.04\%$, mean MCV is 101.09 ± 6.12 fl, mean RDW is $13.1 \pm 1.75\%$, mean WBC is $7.56 \pm 2.19 \times 10^9$, mean neutrophils count is $54.83 \pm 9.56\%$, a mean lymphocytes count is 40.22 ± 6.52 , mean MID value is $6.70 \pm 2.38\%$ and a mean platelet count is $271.64 \pm 76.1 \times 1000$.

Table 2. Comparison of Blood Cell Parameters in the Cord Blood of Newborns Delivered by Vaginal and Caesarean Section.

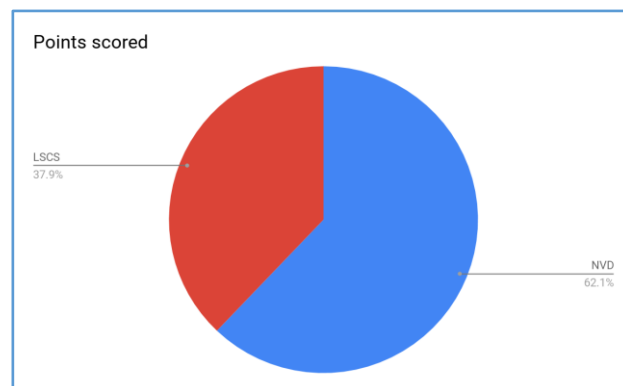
Parameter	Mean \pm S.D. (NVD) (n=559)	Mean \pm S.D. (LSCS) (n=341)
Haemoglobin	14.99 \pm 1.62	14.9 \pm 1.65
Red cell count	4.7 \pm 0.50	4.72 \pm 0.49
Haematocrit	46.49 \pm 8.24	47.34 \pm 7.68
MCV (fl)	100.97 \pm 6.12	101.29 \pm 6.12
MCH (pg)	38.07 \pm 4.46	37.82 \pm 4.65
MCHC (gm/dl)	31.93 \pm 2.70	32.07 \pm 2.71
RDW (%)	13.13 \pm 1.8	13.01 \pm 1.78
WBC	7.57 \pm 2.2	7.55 \pm 2.17
Neutrophils (%)	54.69 \pm 9.56	54.82 \pm 9.82
Lymphocytes (%)	40.16 \pm 6.4	40.32 \pm 6.6
MID (%)	6.74 \pm 2.6	6.64 \pm 1.97
Platelets	274.23 \pm 77.2	267.26 \pm 75.5

Table 2. Shows No Significant Difference in Blood Cell Parameters between NVD and LSCS

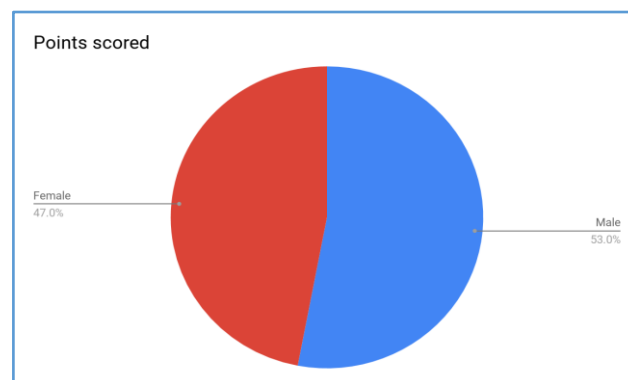
Gender Distribution of Blood Cell Parameters in Neonatal Cord Blood

Parameter	Mean \pm S.D. Male (n=477)	Mean \pm S.D. Female (n=423)
Haemoglobin	14.95 \pm 1.64	15.04 \pm 1.61
Red cell count	4.69 \pm 0.50	4.73 \pm 0.50
Haematocrit	46.96 \pm 7.86	46.6 \pm 8.24
MCV (fl)	101.05 \pm 6.08	101.13 \pm 6.17
MCH (pg)	38.01 \pm 4.53	37.94 \pm 4.54
MCHC (gm/dl)	31.95 \pm 2.76	32.02 \pm 2.63
RDW (%)	13.02 \pm 1.78	13.21 \pm 1.73
WBC	7.45 \pm 2.13	7.69 \pm 2.25
Neutrophils (%)	54.59 \pm 9.5	55.1 \pm 9.53
Lymphocytes (%)	40.04 \pm 6.6	40.42 \pm 6.42
MID (%)	6.78 \pm 2.75	6.62 \pm 1.88
Platelets	268.35 \pm 76.3	275.37 \pm 76.8

Table 3. Shows No Significant Difference in Distribution of Blood Cell Parameters between Male and Female Children



Pie Chart 1. Showing No. of Deliveries by NVD and LSCS



Pie Chart 2. Showing No. of Males and Females Included in the Study

DISCUSSION

Parameter	Current Study	Reference Values	Karachi. ⁴ n=404	Malawi. ⁵ Study n=366	Mashhad. ⁶ (Iran) study n=447	Abidjan. ⁷ Study n=129
Haemoglobin	14.99 \pm 1.63	12-18	14.99 \pm 1.47	16 \pm 1.7	15.9 \pm 1.96	15.7 \pm 1.7
Red cell count	4.71 \pm 0.5	4-5.5	4.29 \pm 0.44	4.52 \pm 0.57	4.45 \pm 1.96	4.35 \pm 0.51
Haematocrit	46.8 \pm 8.04	35-60	45.65 \pm 4.8	47 \pm 6	48.3 \pm 1.96	43.6 \pm 5.5
MCV (fl)	101.09 \pm 6.12	90-110	105.81 \pm 6.24	112.6 \pm 8.9	108.7 \pm 1.96	100 \pm 6.2
MCH (pg)	37.97 \pm 4.53	30-45	34.96 \pm 2.11	31.9 \pm 5.5	35.8 \pm 1.96	34.5 \pm 2.4
MCHC (gm/dl)	31.98 \pm 2.70	28-36	32.47 \pm 2.12	33.5 \pm 2.8	33 \pm 1.96	34.2 \pm 1.0
RDW (%)	13.1 \pm 1.75	10-16			17.1 \pm 1.96	
WBC	7.56 \pm 2.19	4-11	13.61 \pm 4.23	12.3 \pm 4.8	11.62 \pm 1.96	13.7 \pm 5.4
Neutrophils (%)	54.83 \pm 9.56	40-70	50.13 \pm 12.44	62.60	48 \pm 1.96	54.4 \pm 15.4
Lymphocytes (%)	40.22 \pm 6.52	30-50	39.89 \pm 12.24	37.39	42 \pm 1.96	36.5 \pm 12.3
MID (%)	6.70 \pm 2.38	3-10				
Platelets	271.64 \pm 76.1	150-400	256.25 \pm 76.54	259.9 \pm 72.55	257 \pm 1.96	161 \pm 45

Table 4

Among all these values, The RBC cell parameters of Karachi Study are highly significant, WBC cell parameters of Abidjan study are highly significant than the remaining studies. Platelet count, Neutrophil count and Lymphocytes count of the Karachi study are nil significant. Remaining WBC parameters of Karachi study are highly significant. Haematocrit and MCH value of Abidjan study are nil significant. Remaining Red cell parameters of Abidjan study are highly significant. There was no significant gender difference in blood cell parameters and white blood cell indices, which was in agreement with the research done by Mukibi et al and Jasim Mai Marzoki.⁸ There was no significant influence of mode of delivery on blood cell

parameters and white blood cell indices which was in agreement with the research done by Subh salem Al-Mudallal et al⁹ and Jasim mai Marzoki.⁸

CONCLUSION

Full blood counts parameters from neonatal cord blood are summarized as follows: The mean haemoglobin level is 14.99 \pm 1.63 g/dl, Mean Haematocrit value is 46.8 \pm 8.04%, mean MCV is 101.09 \pm 6.12 fl, mean RDW is 13.1 \pm 1.75%, mean WBC is 7.56 \pm 2.19*10, mean neutrophils count is 54.83 \pm 9.56%, a mean lymphocytes count is 40.22 \pm 6.52, mean MID value is 6.70 \pm 2.38% and a mean platelet count is 271.64 \pm 76.1*1000. All the parameters in the study were

within the reference ranges. Mean values of full blood count obtained in this study are comparable to reports from other similar studies. It will be a useful guide for neonatologists and stem cell transplant physicians in our geographical locations. The above study indicates that there is no significant differences in between blood cell parameters of male and female neonates and between NVD and LSCS deliveries. There is no significant difference in distribution of blood cell parameters between male and female children.

Recommendations

Umbilical cord blood can be used for routine haematological testing of a newborn. It could be a useful guide for neonatologists and stem cell transplant physicians in our geographical locations. It could be used irrespective of the gender and type of delivery.

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