ORIGINAL ARTICLE

REFERENCE HAEMATOLOGICAL VALUES FOR FULL TERM HEALTHY NEWBORNS FROM RURAL SINDH, PAKISTAN

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Background: Normal values of complete blood counts show variation from region to region and between different ethnic groups. It is important to establish reference range for these values in our population for clinical use by our physicians. This descriptive cross sectional study aimed at establishing the normal reference values of complete blood counts in physically normal full term new-borns of Panu Aqil, Rural Sind, Pakistan. **Methods:** The study was conducted at Combined Military Hospital, Panu Aqil Cantonment, from January 2010 to March 2011, on 316 term normal neonates selected on the basis of gestational age of 37 weeks or more with uneventful antenatal period. During the initial 12 hours of delivery, 2 ml Cord blood was collected in bottle containing tripotassium ethylene diamine tetra acetic acid (K_3EDTA) as the anticoagulant and Complete blood counts were performed by Sysmex KX-21 automated haematology analyser. Blood films were prepared and stained by Leishman stain. **Results:** The haemoglobin was mean±SD 15.4±1.9 g/dL. The Mean Corpuscular Volume (MCV) was 103.4±4.6 fL, while Mean Corpuscular haemoglobin (MCH) was 33.8±1.6 pg. The Red cell Distribution Width-CV (RDW-CV) was 18.5±1.8%. The total leukocyte count (TLC) was mean±SD 13.7±4.0x10^9 /L. The Absolute Neutrophil count (ANC) was mean±SD 7.7±3.0x10^9 /L. The Absolute Lymphocyte count (ALC) was mean±SD 5.1±1.8x10^9 /L. Platelet count was mean±SD 285±62x10^9 /L. **Conclusion:** Our values provide reference range for haematological values in healthy newborns of Panu Aqil, Rural Sindh, for clinical use by our physicians.

Keywords: Healthy new-borns, haematological, reference values, Rural Sindh

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INTRODUCTION

The idea of having universally accepted normal values of complete blood counts has been changed now. It has been internationally agreed that almost all the previously accepted reference values are affected to some extent by age, race, diet, medicines, analytical method etc. This highlights the importance of establishing standard reference values for the local population.[1] Research on this aspect of haematology started in early 20th century and until now a lot of work has been done in this regard.[2] The importance of comparing the results of reference values cannot be denied. The use of term "normal range" has lost its importance now. The latest concept is to use terms like "reference values/ranges".[3] Determining reference range in physically normal full term neonate has clinical importance in terms of different blood parameters like haemoglobin concentration. This also has impact upon diagnostic, therapeutic as well as preventive aspects of disorders of haemoglobin, platelets and white blood cells.[4–8] Taluka Panu Aqil is an agrarian Taluka. There are three other Talukas of district Sakkur. It has 12 Union Councils namely Baiji, Dadloi, Hingro, Junnas, Mehran, Mubarakpur, Nauraja, Nidapur, Pano Akil, Sadhuja, Sangi, Sultanpur).[5] Thus this area represents the typical socioeconomic conditions and the cultural norms that are prevailing in Rural Sindh. This study was aimed at establishing the normal reference values of complete blood counts in physically normal full term newborns of Panu Aqil, Rural Sind, Pakistan.

MATERIAL AND METHODS

This descriptive study was conducted on 316 full term normal neonates born in Combined Military Hospital, Panu Aqil Cantonment from January 2010 to March 2011. The study was conducted after approval of institutional ethical committee and taking informed written consent from the parents in all the cases. The study sample was selected on the basis of gestational age ≥37 weeks with uneventful prenatal period; normal birth weight (2.5–3.5 kg) delivered through Normal Vaginal Delivery (NVD) or elective lower Section Caesarean Sections (LSCS). Newborns delivered via emergency LSCS were excluded, as were those with any congenital anomalies, respiratory distress, septicaemia or metabolic disturbances, blood group incompatibility, perinatal blood loss, birth asphyxia and abnormal Apgar score. The participants were born to mothers aged 18–35 years, uneventful pregnancy, and haemoglobin ≥10 g/dL. Babies born to mothers with high blood pressure, eclampsia, heart, kidney, or lung disease, blood disease and diabetes mellitus were also excluded. Parity and socioeconomic status of mother

were also taken into consideration. Cord blood (2 ml) was taken in bottles containing tripotassium ethylene diamine tetra acetic acid (K_3EDTA) as the anticoagulant within 1st 12 hours of delivery and transported to the Pathology Department immediately. Complete blood counts were generated by automated haematology analyser. Blood films were prepared and stained by Leishman stain. The study parameters included haemoglobin, total leucocyte count, absolute neutrophil count, absolute lymphocyte count, platelets count, Mean Corpuscular Volume, Red cell Distribution Width-Coefficient of Variation % (RDW-CV%) and Mean Corpuscular haemoglobin. The data was collected through a *pro forma* and analysed by SPSS-17.0. Descriptive analysis was applied for calculation of mean and standard deviation.

RESULTS

Study results are shown in table-1. The mean haemoglobin was mean±SD 15.4±1.9 g/dL with 10.6 g/dL being the lowest haemoglobin while 21.8 g/dL being the highest haemoglobin. Twenty (6.3%) neonates had haemoglobin below 13.0 g /dL, while 49 (15.5%) had haemoglobin between 13 g /dL to 13.9 g /dL. Therefore 69 (21.8%) had haemoglobin below 14.0 g /dL. Only 4 (1.3%) had haemoglobin above 20 g /dL.

Regarding red blood cell indices, the Mean Corpuscular Volume (MCV) was 103.4±4.6 fl, while Mean Corpuscular haemoglobin (MCH) was 33.8±1.6 pg. The Mean Red cell Distribution Width-CV (RDW-CV) was 18.5±1.8%. The total leukocyte count (TLC) was $13.7\pm4.0\times10^9$ /L. The Mean Absolute Neutrophil count (ANC) was mean±SD $7.7\pm3.0\times10^9$ /L. The Mean Absolute Lymphocyte count (ALC) was $5.1\pm1.8\times10^9$ /L. Mean Platelet count was $285\pm62 \times 10^9$ /L.

DISCUSSION

Marked difference between our results and those from the developed countries was observed. Haemoglobin values correlated with a similar study from Karachi (Qaiser *et al*). Studies from (Marhawa *et al*) Northern India, (Maconi *et al*) Italy, (Mukiibi *et al*) Malavi and (Tauseef *et al*) Rawalpindi reported slightly higher values. However, (Matoth *et al*) Scandinavia reported much higher values. Our MCV results corelated well with studies from Karachi, Sindh (Qaiser *et al*) and (Marhawa *et al*) Northern India. Studies from (Maconi *et al*) Italy and (Mukiibi *et al*) Malavi reported slightly higher values. However, (Matoth *et al*) Scandinavia reported much higher values. Our MCH results corelated well with studies from Karachi, Sindh (Qaiser *et al*), (Marhawa *et al*) Northern India, (Maconi *et al*) Italy and (Mukiibi *et al*) Malavi. Our TLC results corelated well with studies from Karachi, Sindh (Qaiser *et al*), (Marhawa *et al*) Northern India, (Maconi *et al*) Italy and (Mukiibi *et al*) Malavi. However, (Tauseef *et al*) Rawalpindi rerported slightly higher values. Our ANC results were slightly higher than studies from Karachi, Sindh (Qaiser *et al*) and (Marhawa *et al*) Northern India. Our ALC results correlated well with studies from Karachi, Sindh (Qaiser *et al*) and (Marhawa *et al*) Northern India. Our Platelet results correlate well with recent studies from Karachi, Sindh (Qaiser *et al*), (Tauseef *et al*) Rawalpindi, (Maconi *et al*) Italy and (Mukiibi *et al*) Malavi. However the older study from (Marhawa *et al*) Northern India reported lower values. This difference may be due to different methodology (manual versus automated methodology). However there is significant concordance between our values and various studies done in South Asian region table 1.

The causes for these differences are multifactorial and mainly due to various demographic, socioeconomic and cultural peculiarities of the Sindhi culture. This difference from the developed western hemisphere is probably due to malnutrition, multiparity, lack of proper ante-natal and natal facilities.[6] A study conducted in rural sindh revealed as much as 29.3% of the pregnant females availing antenatal care facility, mostly (72.3%) from the government health care provider. Strong association was observed between the presence of electricity in the house and utilization of antenatal care. Women from lower and lower middle class were utilizing the antenatal facilities significantly more than those from upper class.[7] Due to various cultural taboos/norms, women are not allowed to frequently attend a health care facility and they also avoid various healthy foods. In addition these women do not have good, clear information about their health nor access to adequate care. Poverty, economic dependence, violence and discrimination are contributory factors. In addition the limited power that many women have over their decision for family planning, as well other aspects of their lives contribute to this scenario.[8] A large number of women in Sindh do not get even necessary treatment when they need it most. They consider local herbal medicine and visit tombs of Saints as these diseases are considered to be result of possession/occupation by ghosts, jinns and aliens. All this happens due to illiteracy and lack of health facilities.[9,10] In Sindhi culture, men avoid to discuss famine issues openly. In such a situation female patients find it difficult to explain their feelings, pain and problems to her gynaecologist. Social problems are the root cause of this disparity.[11] In addition, our personal observation during the study was that the women of rural Sindh are relatively short statured in addition to having Body mass index (BMI) on lower side. Similar observations have also been reported from a study conducted in Khairpur District.[12] All these studies reveal that multiple factors contribute to the haematological reference values.

Table-1: Comparison of our results with various National and International studies

Parameters	Our study, Interior Sindh Mean±S.D	Matoth *et al* Scandinavia[13] Mean±S.D	Marhawa *et al* Northern India Mean±S.D	Tauseef *et al*, AFIP Rawalpindi[14] Mean±S.D	Qaiser *et al*, Karachi Mean±S.D	Maconi *et al*, Italy[15] Mean±S.D	Mukiibi *et al*, Malavi[16] Mean±S.D
Haemoglobin (g/dL)	15.4±1.9	19.3±2.2	16.2±1.5	16.9±1.9	15.0±1.5	16.1±2.0	16.0±1.7
MCV (fL)	103.4±4.6	119±9.4	102.4±7.1		105.8±6.2	108.2±4.3	112.6±8.9
MCH (pg)	33.8±1.6		32.0±3.5		35.0±2.1	35.7±1.8	33.5±2.8
RDW-CV %	18.5±1.8						
TLC ($x10^9$)	13.7±4.0		12.1±6.4	16.6±5.4	13.6±4.2	14.4±4.3	12.3±4.8
ANC ($x10^9$)	7.7±3.0		6.4±1.9*		6.8±1.7*		
ALC ($x10^9$)	5.1±1.8		5.0±1.8*		5.4±1.6*		
Platelets ($x10^9$)	285±62		199±57	258±71	256±77	300±73	260±73

** Converted to absolute counts from percentage values*

CONCLUSION

Reference values of haematological parameters presently in use in our country are mostly based upon observations from the studies conducted on population segments much different from our population, both socioeconomically and geographically. Prior to this study, no reference values for neonatal haematological parameters of umbilical cord blood were available for Rural Sindh. Our values provide the first ever reference range determined for haematological parameters in healthy new-borns of Rural Sindh, for clinical use by our physicians in future.

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