



CODEN [USA]: IAJPB

ISSN: 2349-7750

**INDO AMERICAN JOURNAL OF
PHARMACEUTICAL SCIENCES**<http://doi.org/10.5281/zenodo.1299300>Available online at: <http://www.iajps.com>

Research Article

**ASSOCIATION OF HAEMATOLOGICAL PARAMETERS
REFERENCE VALUES VARIATION WITH VARIOUS
ATTRIBUTING FACTORS**¹Dr. Akhlq Ahmad Tabassom, ²Dr. Muhammad Ahmed Chaudhry, ³Dr. Asad Mehmood,
⁴Dr. Zuhair Zubair¹Medical Officer T.H.Q Hospital Chunian District Kasur.²Medical Officer, Lahore General Hospital³Medical Officer Tehsil Headquarter Hospital Kahuta Distt. Rawalpindi.⁴Faisalabad Medical University, Faisalabad**Abstract:**

Objectives: We assessed reference Hematological parameters values variation including Total Leucocyte Count (TLC), Hemoglobin (Hb), Platelet Counts (PLT) and Red Blood Cells (RBC) in neonates and its comparison with the similar natured research international studies.

Subjects and Methods: Research was descriptive in nature conducted at Services Hospital, Lahore (Department of Hematology) in the time span of six months starting from August, 2016 to January, 2017. Non-probability method of sampling was used for selection of a sample that consisted of 400 neonates. We assessed the samples of the blood by using an automated hematology analyzer (Sysmex Kx-21) for Total Leucocyte Count (TLC), Hemoglobin (Hb), Platelet Counts (PLT) and Red Blood Cells (RBC).

Results: Reference values taken as (mean \pm 7 SD) for RBC, TLC and platelets count were respectively (4.931012 / l & 0.54), (16.109 / l & 5.35) and (258.499109 / l & 70.5). These mean values were more than the values reported in the international research studies. Reference mean Hb value was low than the internationally reported values as (14g/dl & 2.5) which was reported (16.89 g/dl & 1.92) in the international research studies. As per the comparative research the mean values and SD in the international research study were observed about RBC, TLC and Platelets as (4.21012 / l & 1.2), (12.109 / l & 7) and (200109 / l & 50).

Conclusions: Our hematological parameters reference values of neonates are not same as implemented in international research studies; which leads to a conclusion that numerous and different ethnic, maternal, nutritional, environmental, cultural and socioeconomic factors have an effect on the neonatal hematological parameters.

Key words: Total Leucocyte Count (TLC), Hemoglobin (Hb), Platelet Counts (PLT) and Red Blood Cells (RBC), Neonates, Hematological and Parameters.

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Please cite this article in press Akhlq Ahmad Tabassom et al., Association of Haematological Parameters Reference Values Variation with Various Attributing Factors, Indo Am. J. P. Sci, 2018; 05(06).

INTRODUCTION:

We have derived our hematological parameter values from the internationally implemented population-based values [1]. Health, according to WHO is a complete social, mental and physical state; whereas, it not only the disease absence [2]. According to the definition of Kairisto the evaluation of the status of health can be compared with the present parameters with the reference parameters, importance of these parameters lies in various aspects such as clinical, epidemiological research and decisions [2, 3, 4]. A healthy group of population is studied in order to obtain reference values which actually belongs to the reference group [5]. Numerous factors are involved in the variation of the values such as maternal age, racial affects, low socioeconomic status, high altitude and geographical affects, these values may vary with the change of locality [6 – 11].

Numerous perinatal factors are also involved in the variation of the hematological parameters reference range and domain. Neutrophil levels are altered by the perinatal bacterial presence in the individuals. However, hemolytic disease and pyrexia, maternal hypertension before delivery can potentially affect neonatal blood counts specifically neutrophils [17].

In the light of abovesaid factors we aimed in this research the assessment of reference Hematological parameters values variation including Total Leucocyte Count (TLC), Hemoglobin (Hb), Platelet Counts (PLT) and Red Blood Cells (RBC) in neonates and its comparison with the similar natured research international studies.

SUBJECTS AND METHOD:

Research was descriptive in nature conducted at Services Hospital, Lahore (Department of Hematology) in the time span of six months starting from August, 2016 to January, 2017. Non-probability method of sampling was used for selection of a sample that consisted of 400 neonates. We assessed the samples of the blood by using an automated hematology analyzer (Sysmex Kx-21) for Total Leucocyte Count (TLC), Hemoglobin (Hb), Platelet Counts (PLT) and Red Blood Cells (RBC).

Our research sample included apparently healthy, normal, afebrile and conscious male and female neonates under the age of one month; whereas, premature neonates, drug intake history, congenital disease, systemic illness or blood loss were not included in this research. Our research proceedings were carried out in the light of few steps which include an informed written consent from the participants parents or guardians. We took venous blood sample of (2.5 ml) after that these samples were preserved in an anticoagulant bottle which was filled with EDTA (Ethylenediamine tetra Acetic Acid). These samples were transferred to the department of hematology for onward screening and processing. Neonates were observed with an average mean value for RBC in terms of mean and SD as (4.931012 / 1 & 0.54). Higher mean values were observed in the male than the females about RBC in terms of mean and SD as (4.951012 / 1 & 0.51 in males) and (4.911012 / 1 & 0.56 in females). A final process was completed in the automated analyzer machine (Sysmex Kx21) for the detection of Hb, Complete Blood Counts, RBC, TLC and count of the platelets. Final outcomes analysis was made on SPSS software.

RESULTS:

Outcomes were analyzed for qualitative and quantitative variables on SPSS software. Reference values taken as (mean 7 SD) for RBC, TLC and platelets count were respectively (4.931012 / 1 & 0.54), (16.109 / 1 & 5.35) and (258.499109 / 1 & 70.5). These mean values were more than the values reported in the international research studies. Reference mean Hb value was low than the internationally reported values as (14g/dl & 2.5) which was reported (16.89 g/dl & 1.92) in the international research studies. As per the comparative research the mean values and SD in the international research study were observed about RBC, TLC and Platelets as (4.21012 / 1 & 1.2), (12.109 / 1 & 7) and (200109 / 1 & 50). An average value of TLC in the neonates of under one-month age was (16.55 109 / 1 & 5.35), males were observed with a mean value of (16.21 109 / 1). It was observed in the qualitative analysis that (15.1 – 20 109 / 1) was a repeated range in 253 cases (63.25%) as reflected in Table – I.

Table – I: Total Leucocytes Count (TLC)

Statistical Analysis Mode	Statistical variable	Male	Female	Average
Quantitative	Mean	16.89	16.21	16.55
	SD	5.72	4.93	5.35
Qualitative	Ranges		Percentage	Frequency
	< 4 109 / 1		0.2	1
	4 – 11 109 / 1		14.75	59
	11.1 – 15 109 / 1		20	80
15.1 – 20 109 / 1		63.25	253	

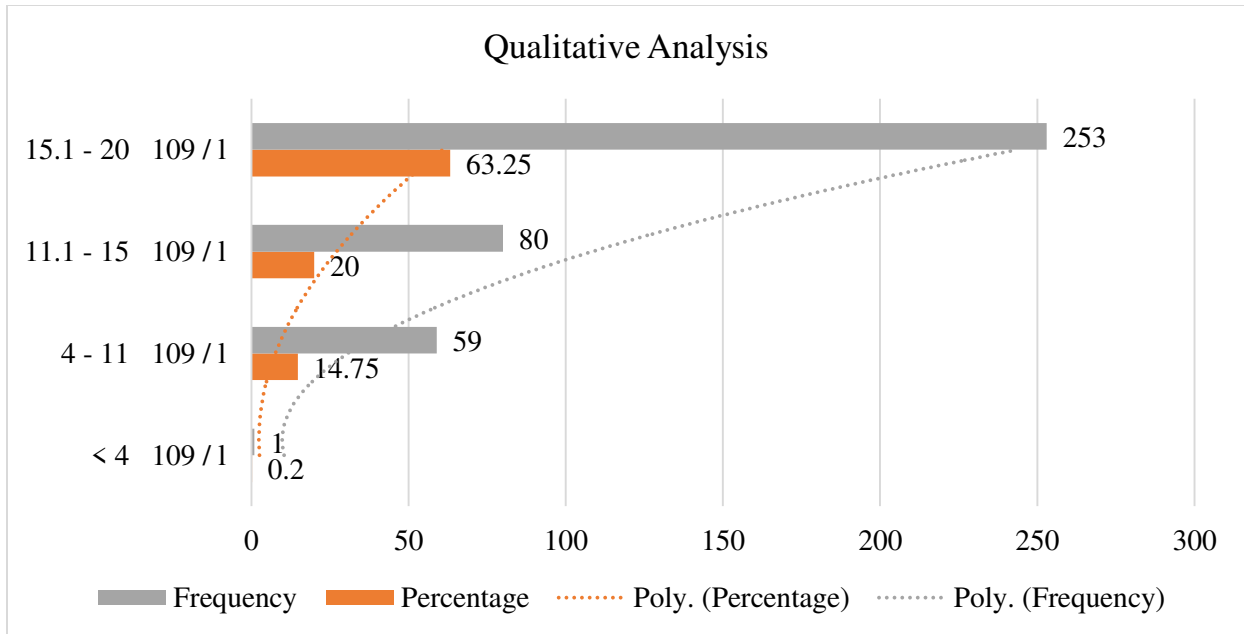


Table – II shows the count of the red blood cells in both males and females with an average mean and SD.

Table – II: Red Blood Cells (RBC)

Statistical Analysis Mode	Statistical Variable	Male	Female	Average
Quantitative	Mean	4.95	4.91	4.93
	SD	0.56	0.51	0.54
Qualitative	Ranges		Percentage	Frequency
	< 4	1012 / 1	3.2	13
	4.1 – 5	1012 / 1	54	216
	5.1 – 6	1012 / 1	38.9	156
	> 6.1	1012 / 1	3.8	15

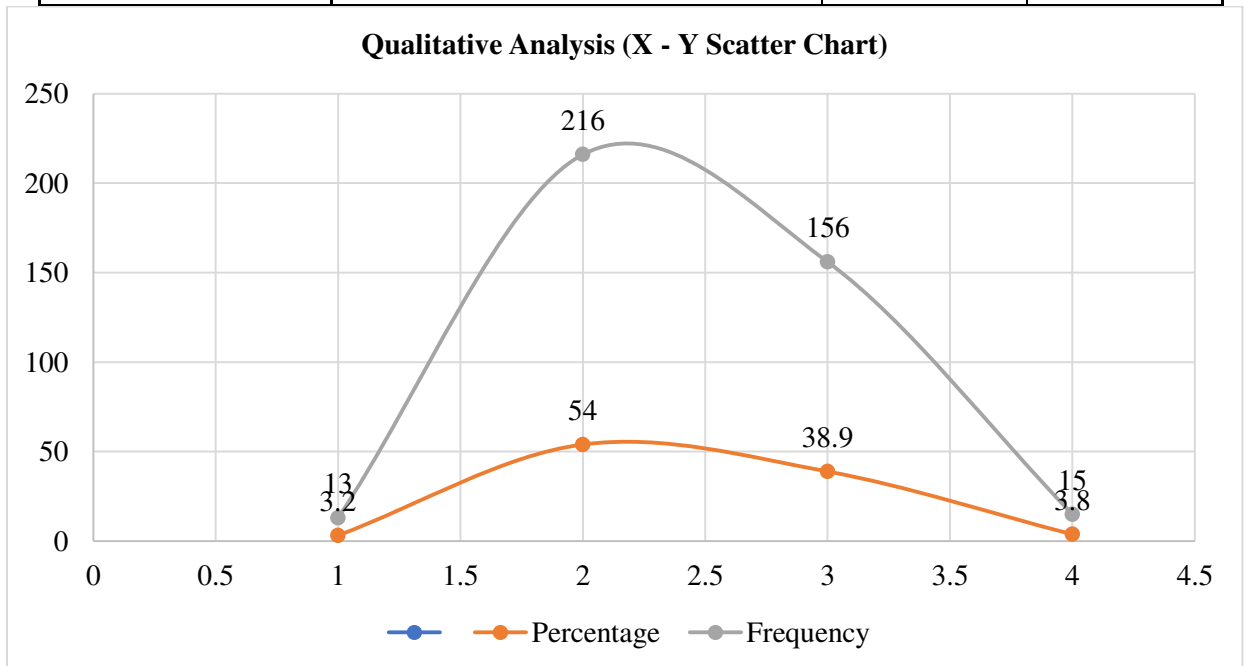


Table – III shows the mean value of hemoglobin (Hb) in both males and females with an average mean and SD at various ranges of the qualitative variables with their respective range and frequency.

Table – III: Hemoglobin (Hb)

Statistical Analysis Mode	Statistical variable	Male	Female	Average
Quantitative	Mean	16.99	16.8	16.89
	SD	1.97	1.86	1.92
Qualitative	Ranges		Percent	Frequency
	< 12 g/dl		0.8	3
	12.1 – 14 g/dl		5.5	22
	14.1 – 16 g/dl		25.8	103
	16.1 – 18 g/dl		42.2	169
	18.1 – 20 g/dl		19.2	77
	20.1 – 22 g/dl		5.5	22

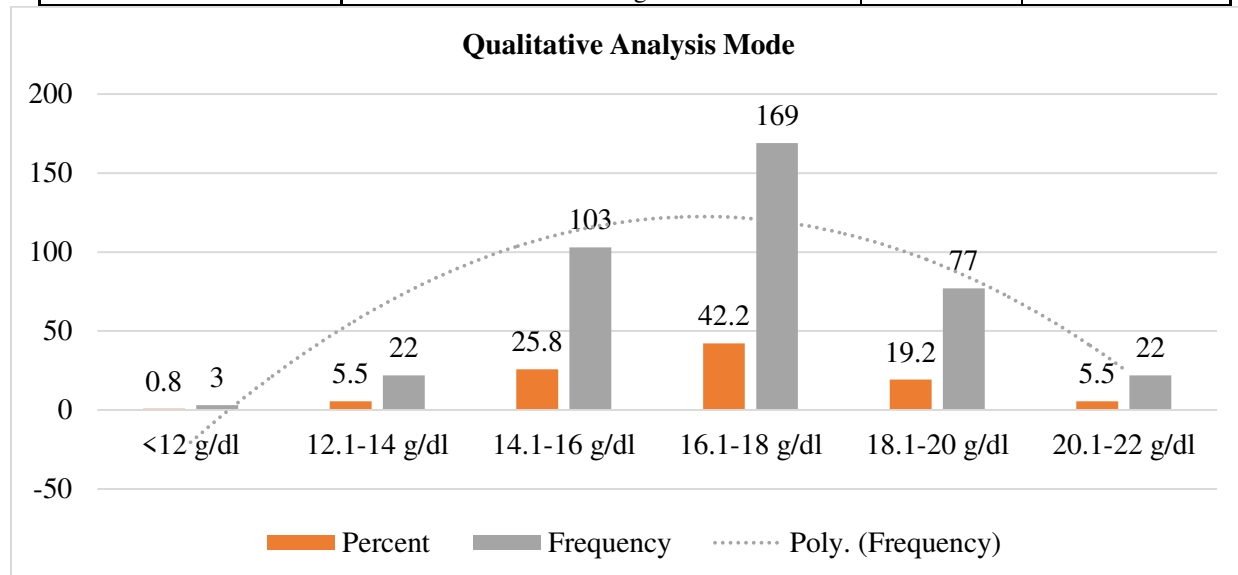


Table – IV shows the mean value of platelets in both males and females with an average mean and SD at various ranges of the qualitative variables with their respective range and frequency.

Table – IV: Platelets

Statistical Analysis Mode	Statistical variable	Male	Female	Average
Quantitative	Mean	261.62	255.3	258.4
	SD	72.8	68.17	70.5
Qualitative	Ranges		Percent	Frequency
	100 – 150 109/l		4	16
	151 – 300 109/l		72.2	289
	301 – 450 109/l		22.8	91
	451 – 600 109/l		1	4

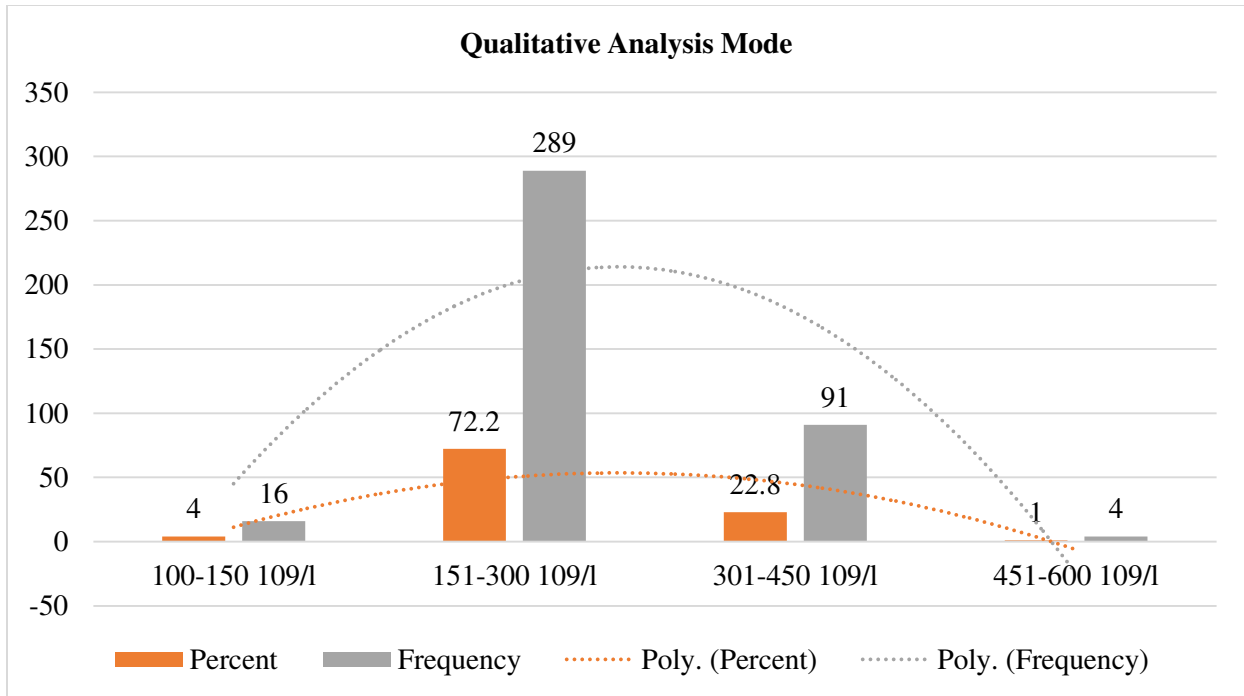
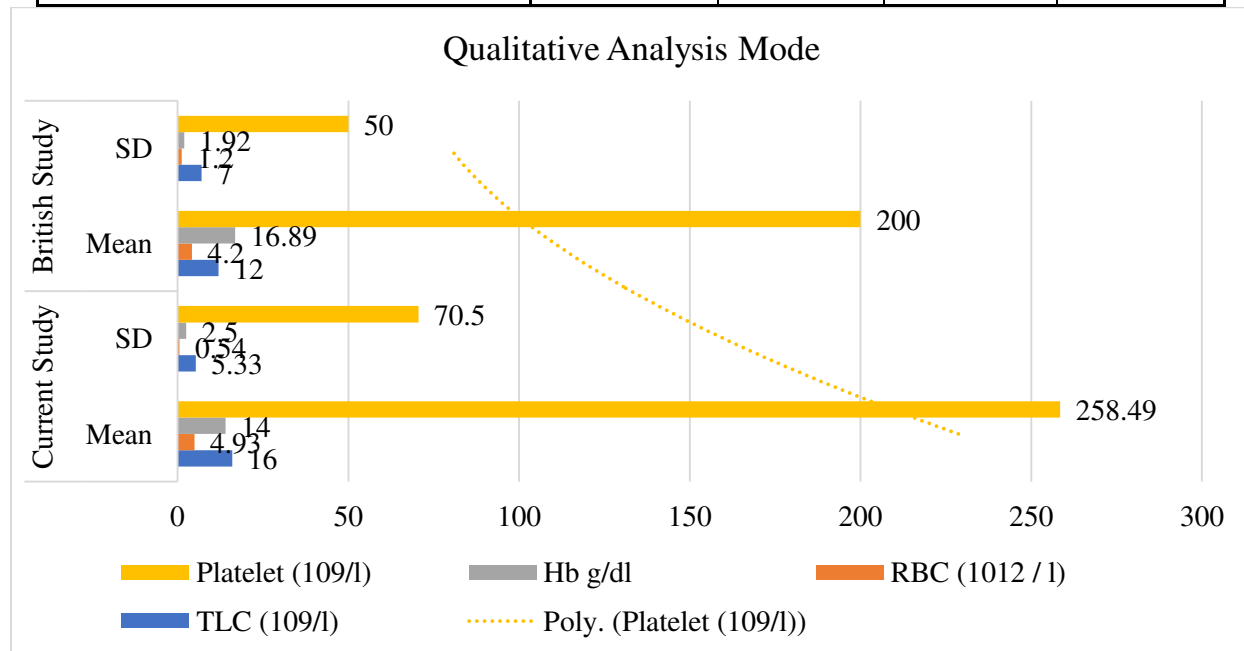


Table –V shows the comparison of the reference research outcomes in terms of mean and SD and current research study.

Table – V: Comparison Between Current Study and Western Study

Hematological Parameter	Current Study		Reference Study	
	Mean	SD	Mean	SD
TLC (109/l)	16	5.33	12	7
RBC (1012 /l)	4.93	0.54	4.2	1.2
Hb g/dl	14	2.5	16.89	1.92
Platelet (109/l)	258.49	70.5	200	50



DISCUSSION:

The basic test of the laboratory is considered as blood complete picture (Blood CP) that can extract vital information about the cells of the blood. This simple test can explore information about platelets, RBC, TLC and Hb. Before any threatening abnormalities the diagnosis can be made through these clinical manifestations that ultimately helps in the management process. There is a wide variation in the hematological parameters because of numerous associated factors [1]. These factors include dietary habits, maternal age, delivery mode, socioeconomic state, nutritional status and hypertension including ethnic variations, altitude and seasonal differences [12 – 14].

Poor nutrition, low socio-economic status and racial affects add in iron deficiency anemia, which is also reported in British and African research studies as an increased consumption of the milk in childhood with enhanced use of vegetables and fruits develops the overall health of the individuals [18, 19]. Impaired motor functions have been reported in the research conducted by Sherriff *et al*, in low levels of Hb under 9.5g/dl in the age of eight-month aged children [20]. There is a considerable variation in the hematological parameter values in neonates i.e. TLC, Hb and RBC count in comparison with the reference research outcomes as reflected in Table – V [1].

There is no variation in the average count of the platelets in both the research studies. Gender was not involved in the variation of the hematological parameter variations (i.e. TLC, Hb, RBC and count of Platelets). These outcomes are not comparable with the research held by Woodliff, Lilleyman and Mitchell and colleagues as they conclude higher values in males than females about the under discussion hematological parameters [1, 15, 16].

There is a need to review all the ranges of these parameters and establish values according to the localities considering all involved factors.

CONCLUSIONS:

There is an involvement of the numerous maternal, nutritional, environmental, ethnic, cultural and socioeconomic factors on the neonatal values of the hematological parameters. An early diagnosis and treatment can be extended to the patients through accurate values implementation. With the help of these implementations under developed countries can reduce their mortality and morbidity rates including Pakistan.

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