

Original article:

Evaluation of Normal Hematological Indices of Young Adults of Known Population: A Clinical Study

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ABSTRACT

Background: These Reference ranges are crucial for monitoring of the pathophysiological alterations after infection or diseased process or after the administration of drugs during clinical interventions and vaccine studies. Detailed study of literature concluded that different population-based surveys have been conducted in developed nations especially amongst the Caucasians, while limited studies are available on Indian ethnic origin. The aim of the present study was to evaluate the normal hematological indices amongst the subjects reporting to the hospital.

Materials and Methods: The present cross section survey was conducted in the Department of Obstetrics & Gynecology, District Hospital, Dhoulpur, Rajasthan, India. Subjects with known pathologic states, diabetes mellitus, hypertension, ischemic heart disease, chronic renal insufficiency, anemia, thyroid conditions, liver diseases with hematological abnormalities, weight loss, chest pain, fever, giddiness, usage of drugs, multiple and regular vitamins, oral contraceptive pills, smokers, alcohol consumption more than two drinks per week, past illness of typhoid, malaria, tuberculosis, dengue within 6 months of the study initiation were excluded from the study. All laboratory researches were performed in accordance with standard operating procedures followed by good laboratory practices. The median and range of all the values were recorded.

Results: The mean hemoglobin concentration was 13 g/dl with a range of 11-15 g/dl. The median PCV value was 43% with the range of 39-43%. The hemoglobin levels amongst males and females less than 40 years was 12.5-17.0 and 9.7-14.1 respectively. The hemoglobin levels amongst males and females more than 40 years was 11.5-16.5 and 10.1-14.3 respectively.

Conclusion: The reference ranges play an important role in determining the health status of the subjects and since they vary with age, geographical distribution and dietary habits, so its becomes important to compare the results of the study with the right reference range

Keywords: Dietary, Hemoglobin, Pathophysiological.

INTRODUCTION

Development and maturity of immune system takes place with age,¹ different hematological variables also tend to change and develop with advancing age¹ although a variety of factors like genetics, gender, altitude, and life style also affect this process.² Most of the factors vary upon on the population and geographical distribution of the area,^{3,4} indicating that reference values cannot validated for one country or age group and cannot be assumed other populations from other countries.² These Reference ranges are crucial for monitoring of the pathophysiological

alterations after infection or diseased process or after the administration of drugs during clinical interventions and vaccine studies.⁵ Since diseases like malaria and HIV/AIDS alter the hematological parameters in dissimilar ways, evaluation of blood samples for full blood counts are therefore now commonly performed to evaluate for differences that could be due to diseases.⁶ Studies conducted in African countries have shown differences in normal values from those seen in other continents.⁷⁻¹⁰ According to a recent cross-sectional survey conducted in Africa found that significant alterations in hematological markers like hemoglobin, platelet count and total white blood count and biochemical variables like alanine transaminases and creatinine values and compared them with the presently available reference values. Detailed study of literature concluded that different population-based surveys have been conducted in developed nations especially amongst the Caucasians, while limited studies are available on Indian ethnic origin. The aim of the present study was to evaluate the normal hematological indices amongst the subjects reporting to the hospital.

MATERIALS AND METHODS

The present cross section survey was conducted in the Department of Obstetrics & Gynecology, District Hospital, Dhoulpur, Rajasthan, India. The study was conducted for a period of 2 years. The reference subjects consisted of adults who came in for regular health checkup for preventive purposes. Only the apparently healthy participants were enrolled in the study. Subjects between 20-70 years, with BMI between 18-25 25 kg/m² were enrolled in the study. Subjects with known pathologic states, diabetes mellitus, hypertension, ischemic heart disease, chronic renal insufficiency, anemia, thyroid conditions, liver diseases with hematological abnormalities, weight loss, chest pain, fever, giddiness, usage of drugs, multiple and regular vitamins, oral contraceptive pills, smokers, alcohol consumption more than two drinks per week, past illness of typhoid, malaria, tuberculosis, dengue within 6 months of the study initiation were excluded from the study. A total of 7500 subjects were screened and Reviewed. All the subjects were informed about the study and a written consent was obtained from all in their vernacular language. The study was approved by the Institutional ethical board. A complete history- medical and family was obtained from all the subjects. Physicians were made to thoroughly screen the subjects. Under complete aseptic conditions venous blood was drawn from the subjects in the morning time. All laboratory researches were performed in accordance with standard operating procedures followed by good laboratory practices. The hematological parameters studied in this survey were hemoglobin level, PCV, MCV, RBC count, WBC and platelet count. All the data was arranged in a tabulated form and analyzed using SPSS software. The median and range of all the values were recorded.

RESULTS

The present study enrolled subjects with the mean age of 56.67 +/- 3.78 years.

Table 1 demonstrates the median values of the parameters surveyed in our study. The mean hemoglobin concentration was 13 g/dl with a range of 11-15 g/dl. The median PCV value was 43% with the range of 39-43%. The median MCV value was 91fl with a range 85-93fl. The median RBC count was 4.7 millions/IL with the range of 3.8-6.1 millions/IL. The median platelet count was 2.1 lakhs/IL. The median WBC count was 6900 cells/IL.

Table 2 illustrates the Hematological parameters amongst different age groups as per the gender. The hemoglobin levels amongst males and females less than 40 years was 12.5-17.0 and 9.7-14.1 respectively. The hemoglobin

levels amongst males and females more than 40 years was 11.5-16.5 and 10.1-14.3 respectively. The PCV amongst males and females less than 40 years was 38-52 and 31-42 respectively. The PCV amongst males and females more than 40 years was 34-50 and 30-42.7 respectively. The RBC range amongst males less than 40 years and more than 40 years was 4.6-6.8 and 4.1-5.6 respectively. The platelet count amongst males was 1.4-3.9 and females was 1.3-4.6.

Table 1: Median values and range of the hematological parameters in our study

Parameter	Median value	Range
Hemoglobin (g/dL)	13	11-15
PCV (%)	43	39-43
MCV (fl)	91	85-93
RBC (millions/IL)	4.7	3.8-6.1
WBC (Cells/IL)	6900	5500-7900
Platelet count (Lakhs/IL)	2.1	1.5-2.7

Table 2: Hematological parameters amongst different age groups

Parameter		<40 years	>40 years
Hemoglobin (g/dL)	Male	12.5-17.0	11.5-16.5
	Female	9.7-14.1	10.1-14.3
PCV (%)	Male	38-52	34-50
	Female	31-42	30-42.7
MCV (fl)	Male	79-98	76-99
	Female	71-95	73-97
RBC (millions/IL)	Male	4.6-6.8	4.1-5.6
	Female	3.6-5.2	3.7-5.2
WBC (Cells/IL)	Male	4200-9500	4300-9700
	Female	4200-11,300	1300-11,600
Platelet count (Lakhs/IL)	Male	1.4-3.9	1.9-3.7
	Female	1.3-4.6	1.3-4.5

DISCUSSION

Presently, developing countries similar to India are fronting serious public health encounters such as obesity, cardiovascular disorder, diabetes and infectious disorders. In this pitch, clinical laboratory theatres a major role for the early and apt diagnosis of life threatening disorders and also offers useful information about health state of an individual. The aim of the present study was to establish region-specific reference intervals for the hematological amongst healthy Indian subjects. In our study, we concluded that reference intervals of some hematological

parameters were changed from the current reporting ranges. It emphasizes on the importance of determining and incorporating the region specific reference intervals in the reporting system of laboratories within our ethnic population. In our study, platelets were low amongst males than females and the upper range of normal was minutely lower than current evaluated ranges. The cause behind the low platelet count is not known. Various factors i.e. genetic environmental and dietary factors have been studied to affect the platelet count from earlier studies.^{11,12} In our study, the mean hemoglobin concentration was 13 g/dl with a range of 11-15 g/dl. The median PCV value was 43% with the range of 39-43%. The median MCV value was 91fl with a range 85-93fl. The median RBC count was 4.7 millions/IL with the range of 3.8-6.1 millions/IL. The median platelet count was 2.1 lakhs/IL. The median WBC count was 6900 cells/IL. Studies from varied geographical areas of India have recognized reference intervals for some biochemical parameters and also found significant alterations amongst liver markers and lipid profile levels amongst healthy Indian subjects.¹³⁻¹⁸ In the present study, the hemoglobin levels amongst males and females less than 40 years was 12.5-17.0 and 9.7-14.1 respectively. The hemoglobin levels amongst males and females more than 40 years was 11.5-16.5 and 10.1-14.3 respectively. The PCV amongst males and females less than 40 years was 38-52 and 31-42 respectively. The PCV amongst males and females more than 40 years was 34-50 and 30-42.7 respectively. The RBC range amongst males less than 40 years and more than 40 years was 4.6-6.8 and 4.1-5.6 respectively. The platelet count amongst males was 1.4-3.9 and females was 1.3-4.6. In our study, the levels of hemoglobin and platelets were lower amongst subjects more than 40 years age group.¹⁹ As age advances, reference interval differs from younger adults that highlights the status of determining the age specific reference values. The few limitations associated with the present study were lack of equal number of males and females and there were no detailed account of medical history and the samples were not recorded at the same time. There was no importance given to smoking history.

CONCLUSION

The reference ranges play an important role in determining the health status of the subjects and since they vary with age, geographical distribution and dietary habits, so its becomes important to compare the results of the study with the right reference range. The present study clearly indicated the ranges for the hematological parameters varies with age and gender. The values are comparatively lower amongst females.

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