Reference Value of Platelet: Findings from a Cross Sectional Study of Dhaka adult population

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Abstract

Introduction: *Platelet count is a common hematological parameter assessed in laboratory and also an important tool for clinical management of patients. Reference value being used in most laboratories in our country, has been provided from the reference value of developed countries. Platelet count varies usually due to age, sex, ethnic origin, dietary habits, socioeconomic status and environmental factor. Therefore, there is a need to establish reference value of platelet for healthy Bangladeshi population. This study was carried out to establish the reference value of platelet of healthy adult population of Dhaka.*

Methods: *A cross sectional study was conducted in the department of Physiology, Dhaka Medical College, Dhaka from July 2017 to June 2018. A total number of 500 healthy subjects from different areas of Dhaka city were selected on the basis of inclusion and exclusion criteria. Platelet count was estimated in the Department of Laboratory Medicine, Dhaka Medical College hospital, Dhaka. For statistical analysis, the reference value was calculated as 2.5th percentile for the lower reference limit and 97.5th percentile for the upper reference limit using SPSS windows version 19.0.*

Results: *The reference values (2.5th percentile- 95th percentile) of platelet count for male & female were 100 – 406 ×103/µl and 123 – 436 ×103/µl respectively. The mean of platelet count was significantly higher in females than male (P <0.001).*

Conclusions: *The reference value of platelet count obtained from this study is lower than practiced reference value and supports the need for nationwide study to establish our population specific hematological parameters.*

Key wards: *Reference value, Hematological parameter, Platelet count*

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Introduction:

Platelets, the smallest circulating blood cells, are produced in the bone marrow and play a crucial role in hemostasis and also have some extra-hemostatic function.[1] An adequate supply of circulating platelets is essential to maintain vascular integrity and to facilitate thrombus formation at sites of vascular injury.[2]

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About thirty years ago, the coulter principle was used to study several thousands of blood samples of unselected donors to define the reference value of platelet count as 150-450 or 150-400x10^9/L.[3] Some recent studies have shown differences in platelet counts by ethnicity, sex and age and these differences could not be explained by environmental factors or illness.[4,5] Platelet being higher in women than in men and in youth than old age,[6] suggesting that the development of reference values for each area may be beneficial for improving the quality of health care.

Currently total platelet count is of great interest in Bangladesh due to Dengue fever. The reference value usually used is that of developed countries and therefore may not be applicable for our country.[7] Inappropriate reference range can cause unnecessary follow up

investigations, treatment and mismanagement of patients.[8] This study aims to determine the reference values of platelet in a sample of Bangladeshi population.

Methods:

This cross-sectional study was conducted in Physiology department of Dhaka Medical College, Dhaka from July 2017 to June 2018.The research work was carried out after obtaining ethical clearance from concerned department and Ethical Review Committee of Dhaka Medical College, Dhaka. A total number of 500 apparently healthy male and female from Dhaka city with the age ranging from 18-45 years & BMI 18.5 to < 30 kg/m^2 were included in this study. All the subjects were free from anemia, hypertension, diabetes mellitus, chronic kidney disease, COPD, liver disease, malignancy, mal-absorption syndrome. The nature, purpose and benefits of the study were explained to each of the subjects in details. They were encouraged to participate voluntarily. Informed written consent was taken from the participants. Detailed family and medical history were taken. Anthropometric measurements of the subjects were done and blood pressure was measured. All the information was recorded in predefined data schedule. With aseptic precaution, 3ml of venous blood was collected from ante-cubital vein. Blood samples were analyzed by Automated Hematology Analyzer [9] in the Laboratory Medicine department of Dhaka Medical College Hospital, Dhaka. The data were analyzed by a computer based statistical program (SPSS version 19.0). The quantitative variables were expressed in mean ± standard deviation and the qualitative variables were expressed in number and percentage. According to CLSI guideline, reference interval is calculated at 2.5th percentile for the lower reference limit and 97.5th percentile for the upper reference limit. Reference values were determined separately for male and female.

Results:

General characteristics of the study subjects are presented in table 1. Among the study subjects 313 were male & 167 were female with mean age 29.8±7.6 years.

Table I

General characteristics of the study subjects (N=500)

Demographic variable	Frequency	Percentage	Mean± SD
Age (Years)			29.8±7.6
18-25	145	29	
26-35	243	48.6	
36-45	112	22.4	
Sex			
Male	313	62.6	
Female	187	37.4	
BMI (kg/m^2)			23.8 2.6
Underweight	7	1.4	
Normal	332	66.4	
Overweight	154	30.8	
Obese	7	1.4	
Blood pressure (mm of Hg)			
Systolic BP			112.99.8
Diastolic BP			72.69.1
Occupation			
Service	227	45.4	
Business	54	10.8	
Housewife	47	9.4	
Others	172	34.4	
Educational status			
Primary	113	113	
Secondary	77	77	
Higher secondary	140	140	
Graduation & above	166	166	

The quantitative variables were expressed in mean ± standard deviation and the qualitative variables were expressed in number and percentage. N= Total number of study subjects.

Table II

Platelet count in different age group of study population

Age group (year)	Platelet (×10^3/µl) Mean (95% CI)	Median (2.5th to 97.5th percentile range)
18-25	258(244-271)	253(95-505)
26-35	255(244-264)	250(210-502)
36-45	244(233-254)	249(67-493)

Table-III

Platelet counts in male and female of study population

Parameter	Males (n=313) Reference interval (2.5th – 97.5th percentile)	Females (n=187) Mean±SD	Reference interval (2.5th – 97.5th percentile)	Mean±SD	p-value
Platelet (×10^3/µl)	100 - 406	243 ± 64	123 - 436	283 ± 77	**<0.001^s**

The reference range of platelet count in adult Bangladeshi male was 100 – 406 $\times 10^3/\mu l$ with a mean of 243 ±64 $\times 10^3/\mu l$ and in adult Bangladeshi female was 123 – 436 $\times 10^3/\mu l$ with a mean of 283± 77 $\times 10^3/\mu l$. The mean of platelet count was significantly higher in females than male ($P < 0.001$) as shown in table III.

Discussion:

In this study, we aimed to establish the reference values of platelet for Bangladeshi adults living in Dhaka city. For determination of total count of platelets we used Automated Penta DX Nexus (Horiba Medical) hematology analyzer, Kyto, Japan. According to the National Committee for clinical laboratory standards (NCCLS), International federation of Clinical Chemistry (IFCC) and Clinical laboratory Standards Institute (CLSI) Guideline, a minimum number of 120 subjects from each group of male and female should be selected to establish a reference value.[7]

Here, we included 500 apparently healthy adults of which 313 are male and 187 are female with age ranging from 18 to 45 years and mean age 29.8±7.6 years. In our study, the mean platelet concentration was 243±64 × $10^3/\mu l$ and 283±77×$10^3/\mu l$ for male and female respectively. Similar platelet concentration for male and female was found in Korea (244×$10^3/\mu l$ and 260×$10^3/\mu l$),[10] UK[11], United state[12] and some other studies.

On the contrary, In New York, platelet count for male and female (143-432×$10^3/\mu l$ and 169-458×$10^3/\mu l$ respectively) are higher than our observation[13]. These dissimilarities may be due to difference in ethnicity and large sample size. In a study in South Tyrol, platelet count (196-473×$10^3/\mu l$) was higher than our observations.[14] This difference may be due to in different geographic areas.

We found that male had significantly lower platelet count than female and this observation agreed with other studies.[15] Some study showed that sex-related difference become relevant only after 14 years of age[6] as estradiole has been demonstrated to trigger platelet formation in megakaryocytic cells.[16]

This evidence has not been translated into clinical practice due to the lack of appropriate reference intervals, and most laboratories still use the single reference interval 150 to 450×$10^3/\mu l$ for all people.

Our study had some limitations. First, data were collected only from Dhaka city. Second, investigations were not carried out to determine healthy subjects. Third, number of male was higher than female in study population.

Conclusion:

In our study, the reference value of platelet count is lower than the reference value currently used in Bangladesh. However, a nationwide study should be carried out to establish the platelet reference value for Bangladeshi population.

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