

# A descriptive cross-sectional study of Platelets count in apparently healthy Eritrean blood donors attending the National Blood Transfusion Center, Asmara, Eritrea

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**Received:** March 03, 2020; **Accepted:** March 31, 2020

## Abstract

Background: Platelets are an important constituent of blood. Safety measures of blood transfusion are important for optimum health environment. To the knowledge of the researchers, there is no study that was conducted concerning Platelets count in apparently healthy Eritrean blood donors. Therefore, this study will help in establishing the reference ranges of Platelets count in them. Objectives: To measure the serum platelets levels and mean platelets volume in apparently healthy Eritrean blood donors attending the national blood bank of Eritrea. Study design: Descriptive cross-sectional study. Materials and methods: 610 Blood donors were incorporated in the study. 4 ml of venous blood was collected into K3EDTA tubes (Becton Dickinson, Plymouth, UK) from all of the participants of the study. Blood samples collected into the (EDTA)-tubes were examined for Platelets count and mean platelet volume. Results: The overall mean of platelets count was  $267.145 \pm (65.915) \times 10^9/L$ , The median and mode of values were both 266.3 thousands/mm<sup>3</sup>. The mean platelet count for the females was 296.122 thousands /mm<sup>3</sup>, and for males was  $252.477 \times 10^9/L$ , and the statistic difference between them was significant. The statistic mean of MPV for males was 8.763 fl, and for females was 8.717, and the difference between the two means also considered insignificant. Conclusion: This descriptive cross sectional study was performed in the National Blood bank in Asmara where platelets levels and mean platelets volume were measured for 610 healthy blood donors. The results were found to be within reference normal ranges. The difference between the males and females results was statistically significant.

**Keywords:** Platelets, Mean platelets volume, Blood donors, Eritrea.

## INTRODUCTION

Platelets are non-nucleated blood cells synthesized in the bone marrow from the same precursor of erythrocytes; the

Megakaryocyte-Erythroid Progenitor (MEP) [1, 2]. The size of platelets is between two to three micrometer, and they usually circulate in the blood for less than ten days before being degraded in the liver and spleen [3]. Measured in femtolitre (fl),

the volume of platelets is called the mean platelet volume (MPV). Demirin et al (2011) reported that MPV of healthy Turkish population is  $8.9 \pm 1.4$  fl, and ranges between 7.2 and 11.7 fl in 95% of the population [4]. The most important function of platelets is to prevent bleeding by the formation of blood clot. Overproduction or overstimulation of platelets leads to thrombophilia; an increased likability to clot formation. The synthesis of platelets occurs in the bone marrow by the segmentation of the megakaryocytes, with the exclusion of the nucleus and DNA from the process. Sloan summarized the pioneering trials of platelet counting in the first half of the 20th century [5], but there was a wide range of discrepancy, such as Ageeler, Howard, and Lucia who regarded platelets as normal in a range from 73,000 to 545,000 per cubic milliliter [6]. The reference normal range of Platelets is now confirmed to be between 150,000 and 400,000 per cubic ml [7, 8]. Apart from clot formation, platelets also secrete important biological factors such as Platelets derived growth factor (PDGF), transforming growth factor beta ( $TGF-\beta$ ), insulin-like growth factor (IGF-1), platelet derived endothelial growth factor (PDEGF), vascular endothelial growth factor (VEGF), and much more [7, 8].

Platelets are an important constituent of blood. Safety measures of blood transfusion are important for optimum health environment. All medical specialties and department need blood transfusion for part of the patients with different diagnoses and at certain disease levels, particularly during operations and other urgent life saving procedures. According to different studies and clinical trial, Platelets count is used as clinical diagnostic measure in detecting different disease conditions related to bleeding disorders. To the knowledge of the researcher there is no study that was conducted concerning Platelets count in apparently healthy Eritrean male blood donors. Therefore, this study will help in establishing the reference ranges of Platelets count in Eritrean people and to correlate them with age and sex of the candidates.

## MATERIALS AND METHODS

### Study Design and Study Area

The study used a descriptive cross-sectional study, and it was conducted in the National Blood Bank, Asmara, Eritrea, during the period from April 01, 2019 to June 30, 2019. The National Blood Bank is the only blood bank in the country that is situated around the National Referral Hospitals of the country.

### Study participants

All voluntary donors during the study period were selected according to the accepted criteria for blood donation, that include; age, weight, physical and medical examination and screening for viral infections (hepatitis B, C and HIV) and the test for syphilis and non-communicable disease (Diabetes, Hypertension etc.). A total of 610 voluntary non remunerated blood donors, 205 females and 405 males, between the ages of 16 and 65 years are consented to participate in the study.

### Data Collection Method

#### Questionnaire

A standard donor questionnaire, designed by ENBTS for counseling purposes, was used to collect information like demographic data, current health status, medical status, medical history and social habits of each blood donors.

## Laboratory Investigation

Blood samples were obtained from the blood donors during blood donation activities of the National Blood Transfusion Service (NBTS). Blood sampling was performed by trained staff working in ENBTS following a standard operating procedure for blood sample collection. 4 mL of venous blood was collected into K3EDTA tubes (Becton Dickinson, Plymouth, UK) and 6mL venous blood was collected into serum tube from all of the participants of the study. Blood samples collected into the (EDTA)-tube Blood samples collected into the (EDTA)-tube were examined for platelet count. The 6mL venous blood samples collected in the serum tube were analyzed for the screening of HIV, hepatitis B virus surface antigen (HbsAg), hepatitis C virus antibodies (HcAbs), and syphilis. Both instruments participate in an external quality assurance program and routine internal quality control product was run before analyzing each sample.

### Data analysis

Data analysis was done using Microsoft Excel 2007 data sheet, the descriptive analytical data and tests of statistical significance were performed, particularly the two-sample t-test (assuming equal variances) for the difference between male and female candidates. Correlation assessment was performed both for age and sex of the candidates to the platelet's levels measured.

## RESULT

The overall mean of platelets count was  $267.145 \pm (65.915) \times 10^9/L$ , the Minimum value being  $20.4 \times 10^9/L$ , and the maximum value being  $495.2 \times 10^9/L$ . The range of values in 95% confidence level is between  $398.975 \times 10^9/L$  and  $135.315 \times 10^9/L$ . The median and mode of values were both  $266.3 \times 10^9/L$ . Mean platelet volume (MPV) in fl (femtolitres) was  $8.745 \pm 0.846$ . the minimum value being 6.94, and the Maximum was 11.69; see table (1). The mean platelet count for the females was  $296.122 \times 10^9/L$ , and for males was  $252.477 \times 10^9/L$ , and the statistic difference between them was significant; see table (2). The statistic mean of MPV for males was 8.763, and for females was 8.717, and the difference between the two means considered insignificant, since the statistic t-test was (-0.63174) and the critical two tailed t-test was (1.96388). It also been found that there is a weak negative correlation between the age of the candidate and his/her platelets count and very weak negative correlation to his/her mean platelet volume, also there was a very weak negative correlation between the candidate's weight and his/her platelets level but at the same time, there was a very weak positive correlation to his/her mean platelets volume; see table (3).

## DISCUSSION

The summary of the results is the overall mean of platelet count was  $267.145 \pm (65.915) \times 10^9/L$ , the minimum value being  $20.4 \times 10^9/L$ , and the maximum value being  $495.2 \times 10^9/L$ . The mean platelet count for the females was  $296.122 \times 10^9/L$ , and for males was  $252.477 \times 10^9/L$ . There were 15 results showing thrombocytopenia (below  $150 \times 10^9/L$ ) and 5 results with thrombocytosis ( $\times 10^9/L$ ).

**Table 1:** The mean platelets count, median, mode, and extreme values, in addition to the weight and age statistics of the study.

Variable	Mean	Median	Mode	Standard Deviation	Standard Error	Sample Variance	Range	Minimum	Maximum
Weight In Kg	60.633	57	55	10.312	0.4175	106.331	60	50	110
Age In years	22.5	17	16	10.808	0.438	116.808	45	16	61
Platelets level ( $\times 10^9/L$ )	267.145	266.3	266.3	65.915	2.67	4344.77	474.8	20.4	495.2
Mean platelet volume MPV (fl)	8.745	8.6	8.49	0.846	0.034	0.716	4.75	6.94	11.69

**Table 2:** Test of significance between male and female platelet counts and mean platelets volume

Category	Mean Platelets Level	Comment	Mean Platelets Volume	Comment
Males	252.477	Calc-t=8.126872 Critical-t=1.963873: Difference is <b>significant</b>	8.732395	Calc-t= 0.516841, Critical-t= 1.963873: Difference is <b>insignificant</b> .
Females	296.122		8.769902	

**Table 3:** Pearson's correlation between the weights and ages of the candidate and their platelets levels

Parameter	Correlation to Platelets count	Comment	Correlation to MPV.	Comment
Weight	-0.16021	<b>Very weak Negative</b>	0.016633	<b>Very weak positive</b>
Age	-0.30288	<b>Weak negative</b>	-0.03633	<b>Very weak Negative</b>

**Table 4:** Comparison between the current study and different African studies

Parameter	Mali (2019)	Ethiopia (2018)	Sudan (2016)	Turkey (2011)	Ethiopia (1999)	Eritrea 2019 (current study)
<b>Study Participants</b>						
Male	125	143	500	122	280	405
Female		146		204	205	205
<b>Total</b>	<b>125</b>	<b>289</b>	<b>500</b>	<b>326</b>	<b>485</b>	<b>610</b>
<b>Platelets Count (Mean <math>\pm</math> SD in <math>\times 10^9/L</math>)</b>						
Male	219.6 (SD $\pm 46.3$ )	Median = 275.0	215.15 (SD $\pm 68.37$ )	258 (SD $\pm 62$ )	207 (SD $\pm 62$ )	252.477
Female	-	Median = 288.0			202 (SD $\pm 67$ )	296.122
<b>MPV. (in fl)</b>						
Male	9.5 (SD $\pm 3.6$ )	N/A	N/A	8.9 (SD $\pm 1.4$ )	N/A	8.763
Female						8.717
<b>Comments</b>	Study participants were only males.	The study was in different age groups, we chose the adult group for comparison	Study participants were only males.	Categorized according to ages not gender.	--	High mean values.
<b>References</b>	[11]	[10]	[8]	[4]	[9]	

A study that was conducted by Abbas et al (2016) in Sudan (west to Eritrea) for platelets count in apparently healthy Sudanese blood donors, which had been carried out in Gezira state documented a platelet range of maximum  $689 \times 10^9/L$  and minimum value of  $9 \times 10^9/L$ , and in particular ranging 9 to 149 (67 cases), 150 to 387 (426 cases) and 403 to 689 in 7 cases [8]. There were only 13 results of Platelets count above  $400,000 \times 10^9/L$  in our current study, the highest being  $495.2 \times 10^9/L$ ; not as extreme as the Sudan study. In Ethiopia, southern to Eritrea, a descriptive study was held in 1999, recruiting healthy HIV-ve blood donors for Hematological values assessment. They measured the platelets levels of 485 candidates: 280 males and 205 Female. The mean platelet level in males was  $(207 \pm 62)$

$\times 10^9/L$  with a 95% range of  $97-324 \times 10^9/L$  and in females was  $(202 \pm 67) \times 10^9/L$  with a 95% range of  $98-352 \times 10^9/L$  [9]. When comparing those results with the mean values in this current study seems considerably high, but when compared with a recent Ethiopian study (2018) the results are relatively similar [10], however, all these results are within the reference ranges. A concise comparison between similar studies and the current study is given in table (4).

This current study has the advantages of recruiting a quantitatively representing sample, as the standard sample size, by equation is 601. It also included the mean platelet volume MPV as a variable, which not being performed by half of the

compared studies in table (4). The study also screened for HIV Hepatitis B and Hepatitis C and Syphilis. As a disadvantage, this study did not consider the geographic or ethnic distribution of the donors.

The authors recommend establishing a database of Eritrean reference ranges for hematological values, micronutrients and macronutrients.

## CONCLUSION

This was a descriptive cross-sectional study performed in the National Blood bank in Asmara where platelets levels and mean platelets volume were measured for 610 healthy blood donors. The results were found to be within reference normal ranges. A comparison was blotted in table between recent similar recent studies from Ethiopia, Sudan, Mali, and Turkey.

### Acknowledgement

We would like to thank for the Medical Director of National Blood bank of Eritrea.

### Authorship contributions

Dr. Faris Mohamed Awad Abdon and Dr. Elias Teages Adgoy designed the study and prepared the literature. Mr. Nahom Yacob Berhane and Ms. Senet Awolker Ibrahim performed the practical procedure and collected the data. Dr. Adil Khalil Hussein Khalil is the counselor and the critical reviewer of the experiment. Professor Yemani Seyoum reviewed the draft for final approval. Dr. Osama Sharafeldin Abbadi performed the statistical analysis and prepared the final manuscript.

### Conflict of Interest

We declare that we have no conflict of interest.

### Financial Support

None declared.

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