OPEN ACCESS
Scholars Bulletin
Abbreviated Key Title: Sch Bull
ISSN 2412-9771 (Print) |ISSN 2412-897X (Online)
Scholars Middle East Publishers, Dubai, United Arab Emirates
Journal homepage: https://saudijournals.com

Subject Category: Human Physiology

Coagulation Properties of Blood in Healthy University Students in Port Harcourt

Abiye Tamuno-Opubo[1*], Rosemary Oluchi Stanley[2], Jerry Dumley Nwiyor[1], Siyeofori Belema Dede[3], Joy Tonye Wihioka[3], Zosa Ugbana Deinye[4], Miracle Nkasiobi Enyindah[1]

[1]Department of Human Physiology, Rivers State University, Nigeria
[2]Department of Internal Medicine, University of Port Harcourt Teaching Hospital, Rivers State, Nigeria
[3]Rivers State Primary Health Care Management Board, Rivers State, Nigeria
[4]Department of Public Health Science, Rivers State University, Nigeria

DOI: 10.36348/sb.2023.v09i08.003 | **Received:** 14.08.2023 | **Accepted:** 23.09.2023 | **Published:** 25.09.2023

***Corresponding author:** Abiye Tamuno-Opubo
Department of Human Physiology, Rivers State University, Nigeria

Abstract

Despite the fact that the World Health Organization (WHO) had provided an average global reference data of Coagulation Properties (CP) of blood in the world, available statistics still suggest a significant discrepancy in CPs of blood among various age groups, socioeconomic classes and races in different locations of the world. Here in Port Harcourt Nigeria, absence of such local reference data had continued to pose over-reliance on the WHO global standards without recourse to our distinctive geospatial and socioeconomic peculiarities. As a result, this study therefore investigated coagulation properties of blood in healthy university students in Port Harcourt. A total of 157 participants were recruited into the study using Stratified Random Sampling techniques. They were administered well-structured questionnaires for an on-the-spot data collections. Thereafter, 5ml of venous blood were aspirated for various coagulation properties (Bleeding, clotting and Prothrombin times and Platelets Counts) investigation. Clotting and bleeding times were measured instantly using capillary and Ivy's methods respectively. Results from the study revealed a significant ($\rho \leq 0.05$) coagulation difference between the WHO standards and both gender (male, 311032 ± 17300* and female, 293600 ± 12800*) for platelets counts. In the age groups, only ≥40 group were significant to all CP (10.30 ± 0.00* for BT, 10.00 ± 1.30* for CT, 10.22 ± 2.88* for PT and 190320.73 ± 1886.45* for PC). Similar significant result was also noted for Obese Class 2, morbid obesity and protein diet groups as compared with the Control. This study therefore concluded that CP significantly vary with the WHO standards, age, gender, BMI and nutritional background and recommended similar study be conducted in other locations in Nigeria and Africa.

Keywords: Bleeding Time, Clotting Time, Prothrombin Time, Platelet Count.

1. INTRODUCTION

Haemostasis is a complex physiological process, maintaining the fluidity of blood and is regulated by delicate balance existing between thrombogenic and anti-thrombogenic mechanisms present in the body (Palta and Richa, 2015).

Coagulation or clotting is defined as the process in which blood loses its fluidity and becomes a jelly-like mass few minutes after it is shed out or collected in a container (Sembulingam and Sembulingam, 2012). Coagulation of blood occurs through a series of reactions due to the activation of a group of substances (clotting factors) (Teri, 2006). The liver synthesizes prothrombin and other coagulation factors (Factor II, VII, IX, and X) that are carboxylated post-translationally (Onwurah, *et al.*, 2018). Blood Clotting occurs in three stages: Formation of prothrombin activator, conversion of prothrombin into thrombin, and conversion of fibrinogen into fibrin. Formation of prothrombin activator occurs through two pathways: intrinsic pathway and extrinsic pathway. Procoagulants or hemostatic agents are the substances which accelerate the process of blood coagulation e.g. thrombin, snake venom etc. (Guyton and

Hall, 2015). These tests detect most abnormalities in haemostasis. If found to be abnormal the patient is referred for definitive tests which may be available only in specialized laboratories. (Sembulingam and Sembulingam, 2012).

WHO had provided reference data for coagulation properties of blood, and this control data is effective in different geospatial region of the world. The seven continents of the world in which this "WHO reference values" were deduced from have their different socio-cultural diversities, socio economic background, environment, nutritional status, and levels of education. Africa been the least developed continent, have no significant effect on the generated reference values following the ratio of 1:7 i.e. Africa versus the other continents, makes the standard not very reliable because of the significant difference in cultural diversities, nutritional status, level of education, environment, and socio-economic status. Local findings had shown a significant absence of local reference data on the coagulation properties of blood in this part of the world. As a result of this study being a baseline study, it tends to bridge the gap by providing local reference values for the coagulation properties of blood of undergraduates in Port Harcourt. This research is aimed at investigating coagulation properties of blood in healthy university students in Port Harcourt, Rivers State Nigeria.

2. METHODOLOGY

2.1 Study Area

The area of this study were University of Port Harcourt, Rivers State University and Ignatius Ajuru University of Education, all in the city of Port Harcourt, Rivers State of Nigeria. The bench work for haematological investigations was done in the Laboratory of the Department of Human Physiology, Faculty of Basic Medical Sciences, College of Medical Sciences and Rivers State University, Port Harcourt, Nigeria.

2.2 Study Sample

The population that was recruited into this study comprised of apparently healthy male and female undergraduate and post graduate university students of different socioeconomic classes in Port Harcourt. A total of 157 participants was recruited using stratified random sampling techniques. Simultaneously, individuals with HIV/AIDS, pregnant women, chronic diseases and individuals below the age of 16 were excluded from the research. Also, individuals above 45 years were not engaged in the study.

2.3 Study Design

A cross sectional study design was used and the respondents were grouped into 4. They were divided into 4 groups ranging from 2-5.

Group 1 was the control and has the World Health Organization (WHO) reference as the standard for comparison.

Group 2 was Gender relationship with blood coagulation.

Group 3 was effect of Age on blood coagulation

Group 4 was relationship between BMI (Obesity) and blood coagulation; while

Group 5 was impact of nutritional difference on blood coagulation.

2.4 Data Collection

A descriptive cross-sectional approach was used to administer the well-structured questionnaire to the various volunteers for primary data collection, thereafter blood samples was collected upon informed consents.

2.5 Ethical Clearance

The Letter of Introduction was obtained from my Head of Department, Human Physiology and was presented to the various respondents. Consent of participants was sought after while presenting the letter of Introduction.

All procedures were done in consonant with the ethical standards of the Rivers State University for the use of human subject in research.

2.6 Method of Data Analysis

All data was analysed using Statistical Package for Social Sciences (SPSS) version 23.0 and also the Post-hoc test for multiple comparison.

3. RESULTS

Table 1: Relationship between Coagulation Properties of Blood and Gender

Gender	N (N = 157)	Bleeding Time (min)	Clotting Time (min)	Prothrombin Time (sec)	Platelet Count (cm)
WHO Reference		5.00 ± 0.00	6.30 ± 0.00	12.25 ± 0.00	275000 ± 0.00
Male	76	5.30 ± 2.30	5.30 ± 3.30*	11.87 ± 2.21*	311032 ± 17300*
Female	81	6.30 ± 3.00*	6.30 ± 0.30	11.01 ± 1.12	293600 ± 12800*

Result figures are expressed in Mean ± SEM. * represent values that are statistically significant upon comparison with the control (WHO Reference). The mean difference is significant (ρ) at 0.05 level

Table 2: Age and coagulation pattern of blood in healthy University Students

Age Groups (Years)	N (N = 157)	Bleeding Time (min)	Clotting Time (Sec)	Prothrombin Time (sec)	Platelet Count (cm)
WHO Reference		5.00±0.00	6.30 ± 0.00	12.25 ± 0.00	275000.00 ± 0.00
16-23	40	5.30 ± 1.00	4.30 ± 2.30*	12.56 ± 2.11	281606.27 ± 6245.05*
24-30	42	5.00 ± 1.30	5.30 ± 2.30	12.69 ± 1.10	298452.23 ± 4022.02*
30-40	37	7.00 ± 2.30*	6.00 ± 1.00	13.32 ± 1.09	275102.15 ± 780.33
≥40	38	10.30 ± 0.00*	10.00 ± 1.30*	10.22 ± 2.88*	190320.73 ± 1886.45*

Result figures are expressed in Mean ± SEM. * represent values that are statistically significant upon comparison with the control (WHO Reference). The mean difference is significant (ρ) at 0.05 level

Table 3: Body Mass Index and Coagulation Properties relationship

Body Mass Index (Kg/m^2)	N (N = 157)	Bleeding Time (min)	Clotting Time (Sec)	Prothrombin Time (sec)	Platelet Count (cm)
WHO Reference		5.00 ± 0.00 (1-9)	6.30 ± 0.00 (3-10)	12.25 ± 0.00 (11-13.5)	275000.00 ± 0.00
≤18.4 (underweight)	29	4.00 ± 0.00*	6.30 ± 2.30	12.05 ± 1.00	312046.32 ± 6778.10*
18.5 - 24.9 (Normal)	32	5.30 ± 0.30	7.30 ± 3.30*	12.30 ± 0.30	315457.23 ± 4389.41*
25.0 - 29.9 (Pre-obese)	30	5.00 ± 0.00	5.30 ± 1.00	11.30 ± 1.30	275105.03 ± 400.00
30.0 - 34.9 (Obese Class 1)	27	5.30 ± 1.30	6.00 ± 2.00	12.30 ± 0.30	276002.25 ± 780.04
35.0-39.9 (Obese Class 2)	22	2.00 ± 0.30*	9.00 ± 0.30*	13.30 ± 1.30*	187600.68 ± 2600.37*
≥40 (Morbid Obesity)	17	1.30 ± 1.00*	7.30 ± 1.30*	13.00 ± 0.00*	152337.49 ± 3800.47*

Result figures are expressed in Mean ± SEM. * represent values that are statistically significant upon comparison with the control (WHO Reference). The mean difference is significant (ρ) at 0.05 level

Table 4: Relationship between nutritional/Dieting and blood coagulation

Nutrition	N (N = 157)	Bleeding Time (min)	Clotting Time (Sec)	Prothrombin Time (sec)	Platelet Count (cm)
WHO Reference		5.00±0.00 (1-9)	6.30±0.00 (3-10)	12.25±0.00 (11-13.5)	275000.00± 0.00
Carbohydrates	48	5.30±1.30	7.30±2.30	14.30±1.00*	277503.23±3010.08
Proteins	45	3.30±0.30*	2.00±0.30*	10.30±0.30*	287500.00±0.00*
Vitamins/ Minerals	16	4.00±2.00*	2.30±0.30*	11.30±0.30	301822.89±801.34*
Balanced Diet	48	5.30±1.00	3.00±1.30*	12.30±1.00	297433.02±339.44*

Result figures are expressed in Mean ± SEM. * represent values that are statistically significant upon comparison with the control (WHO Reference). The mean difference is significant (ρ) at 0.05 level

4. DISCUSSION

This study established a haematological reference values in supposedly healthy populations among University Students in Port Harcourt. Age, Body mass index, gender and nutrition were the independent determinants. There were significant Body mass index, nutrition, age and gender-related differences in the haematological reference ranges established in this study that will be used for the assessment of BT, CT, PT, and platelet Count. Which are usually involved in diagnosis of some health-related conditions.

4.1 Gender variations and Haematological Parameters in Port Harcourt

In Table 1, observation was made when compared with the reference ranges using the World Health Organization reference value as standard. Reference ranges for BT, CT, PT, and platelets counts were higher among males compared to females which is attributed to the monthly menstrual blood loss in female and during child birth. This finding tally with reports from other studies in Africa (Lugada *et al*., 2009) who concluded in his study that platelets count is higher in females than in males. While the BT and CT were higher in females than in males which is consistent with reports from W.H.O.

4.2 Age and Haematological Parameters in Port Harcourt

In Table 2, Age was found to be significantly associated with haematological parameters in group 2 (16-23) with significant difference noted in CT, and Platelet Count as compared with the control group which are the W.H.O standard values. Those in Group 3 (24-30) had significant changes on just Platelet Count while the BT, CT, and PT had no significant changes when compared with the control group. Those who are in Group 4 (30-40) had significant increase in BT while there was no significant difference in their CT, PT, and Platelets Count.

4.3 BMI and Haematological Parameters in Port Harcourt

In Table 3, effect of Body mass index was observed to be significantly different with underweight in BT, and Platelet count, when compared with the control (WHO reference) with no significant difference in CT, and PT. For the Normal, there was significant changes in CT, and Platelet count. While BT and PT had no significant change. For the Pre-Obese and Obese class 1, it was observed that there was no significant difference in all the haematological parameters BT, CT, PT, and Platelets count) as compared with the control group. For the Obese class 2 and Morbidly Obese, it was observed that there was significant difference in all the haematological parameters BT, CT, PT, and Platelets count) as compared with the control group.

4.4 Nutritional Difference and Haematological Parameters in Port Harcourt

In Table 4, nutritional difference was observed to be significantly correlate with haematological parameters in this study. The results with respect to BT, CT, PT and Platelet Count were normal compared to the control while PT had significant variation when compared with the control for the Carbohydrates group. For proteins, the results of all the haematological parameters had significant variations when compared with the control. BT, CT, and Platelet Count had significant variation when compared to the control while PT had no significant variations for the Vitamins/Minerals group, In Balanced Diet Group, CT and Platelet Count had significant differences with respect to haematological parameters when compared to the control while BT, and PT had no significant variations.

5. CONCLUSION

Based on the above findings, this study therefore concluded that gender, Age, Body mass index and nutrition of the people of Port Harcourt significantly ($\rho \leq 0.05$) affected their haematological parameters as compared with the global WHO Standards.

REFERENCES

- Guyton, C., & Hall, J. E. (2021). *Guyton and Hall Physiology Review* (Twelfth Edition), Saunders Elsevier Publisher.
- Lugada, E. S., Mermin, J., & Kaharuza, F. (2004). "Population based hematologic and immunologic reference values for a healthy Ugandan population," *Clinical and Diagnostic Laboratory Immunology*, 11(1), 29-34.
- Onwurah, O. W., Onyenekwe, C. C., Ifeanyichukwu, M., Ezeugwunne, I. P., Odiegwu, C. N. C., & Igweze, Z. G. (2018). Haematological values for children, adults and geriatrics in Nnewi and environs, Anambra State, Nigeria. *Journal of Hematology & Thromboembolic Diseases*, 6(1), 1-3.
- Palta, S., & Richa, S. (2015). Overview of the coagulation system. *Indian Journal of Anaesthesia*, 58. 10.4103/0019-5049.144643
- Sembulingam, K., & Sembulingam, P. (2012). *"Essentials of medical physiology"* (6th Edition), New Jaypee Brothers Medical Publishers.
- Teri, J. (2006). *Blood Clotting Mechanism.* The Surgical Technologist. 80120-8031.