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AN APPRAISAL OF THE REFERENCE RANGE FOR BLEEDING TIME AMONGST YOUNG NIGERIA ADULTS

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ABSTRACT

Background

This study aims to create baseline values that reflect the distinct physiological traits of this population by evaluating the reference range for bleeding time among young adults in Nigeria. Bleeding time, an important hemostatic characteristic, varies among groups as a result of genetic, environmental, and lifestyle influences. This study seeks to add useful information to the sparse body of knowledge on hemostatic characteristics particular to the Nigerian population by undertaking a thorough examination of bleeding time in a sample of young Nigerian people.

Method

With a cross-sectional design, the study enrolls a varied group of healthy adults between the ages of 18 and 30. Bleeding time measurements are made using standardized procedures, and the outcomes are contrasted with accepted global reference ranges, gender, platelet count, and bleeding time variability.

Results

This study adds to our understanding of hemostasis in various groups and emphasizes the value of individualized reference intervals for diagnostic and therapeutic procedures.

Conclusion

The researcher's conclusions have significance for clinical practice, assisting medical personnel in accurately diagnosing bleeding problems and enhancing patient treatment plans for young adults in Nigeria.

Recommendations

Healthcare institutions and diagnostic laboratories in Nigeria should adopt bleeding time reference ranges that reflect the local population's physiological characteristics rather than relying solely on international standards.

Keywords: *Bleeding, pregnancy, clinical practice, Hemostasis, Nigeria*
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INTRODUCTION

An appraisal of the reference range for bleeding time amongst young adults involves examining the current understanding of bleeding time, its relevance, measurement methods, factors affecting bleeding time, and the establishment of appropriate reference ranges. The duration of time it takes for bleeding to stop following a normal skin cut or puncture is measured by a laboratory test called bleeding time. It explains how platelet adhesion and aggregation create a platelet plug at the site of damage during the initial hemostasis process. Bleeding time, however, does not directly reflect secondary hemostasis or coagulation-related parameters and is not a reliable indicator of overall hemostatic function (Arble &Arnetz, 2021).

The Ivy approach is the one that is most frequently employed to gauge bleeding time. It entails making a tiny cut on the earlobe or forearm and timing how long it takes for the blood to cease flowing. However, this approach has several limitations, including methodological variability, a lack of established protocols, and poor reproducibility. Platelet count, platelet function, von Willebrand factor levels, blood vessel integrity, and general vascular health are some of the variables that can affect bleeding time. Aspirin and other antiplatelet medications can increase bleeding times by impairing platelet function. Lengthened

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bleeding times can also be caused by genetic diseases such as von Willebrand disease (Ezigbo, Mba, Yelpoji, & Okoye, 2020).

The population under study, the measuring method, and the laboratory standards can all affect the reference ranges for bleeding times. It is crucial to remember that bleeding duration can be influenced by elements other than primary hemostasis, which renders it a less accurate indicator of overall hemostatic function. Many clinical laboratories have discontinued using bleeding time as a standard test due to the limitations and unreliability of the Ivy approach. The clinical utility of bleeding time, which was once utilized as a screening test for bleeding disorders, has decreased over time due to its shortcomings and the advent of more accurate and reliable diagnostics. A more thorough and precise evaluation of hemostatic function can be obtained using laboratory assays such as platelet function testing, coagulation factor assays, and genetic screenings for bleeding disorders.

A careful equilibrium between the vascular endothelium, platelets, and the coagulation cascade orchestrates hemostasis, the complex physiological process that preserves blood fluidity and inhibits excessive bleeding. Bleeding time measurement is a well-known but contentious approach among those used to evaluate primary hemostasis. It has long been believed that the time it takes for bleeding to stop following a normal skin incision or puncture is a good predictor of platelet function and vascular integrity. The clinical relevance and usefulness of bleeding time assessments, particularly in young individuals, have recently come under criticism (Ibrahim, Salem, Farj, Abdullah, Othman, and Mohammed, 2019).

Early in the 20th century, medical professionals began investigating the use of bleeding time as a diagnostic tool in search of quick and repeatable techniques to spot impending bleeding disorders. Dr. Florence Ivy pioneered the Ivy method in the 1920s, and it quickly gained popularity. However, concerns regarding the method's dependability and its limits in offering a thorough assessment of primary hemostasis emerged even within its historical context.

While some studies pooled all age groups and provided reference values without breaking them down by sex, others did the opposite. These pose a restriction on how the reference ranges can be applied in routine clinical decision-making. In a similar vein, other research conducted in hospitals on a particular target population, such as blood donors, does not apply to the general populace. The majority of the investigations were limited to certain geographic subpopulations. Nigeria consequently lacks current reference ranges that are accurately indicative of its overall healthy population. As a result, the majority of bleeding time references used in Nigeria come from populations in the West. Due to the enormous size of the country and the associated expenditures on large population studies, establishing reference values in Nigeria is a significant problem, and several efforts are restricted to tiny regional populations. As a result, the goal of this study is to identify Nigeria's bleeding time reference values. The primary aim of this study is to determine the reference range of bleeding time among young adults in Nigeria and the deviations in gender. The specific objectives include a critical assessment of the reference ranges for bleeding time among young individuals, taking into account measuring methods and population characteristics. Second, to identify and assess the different variables, such as platelet count, platelet function, vascular integrity, and pharmaceutical effects, that can affect bleeding time measures. Third, to add to the body of knowledge by providing a current and thorough examination of bleeding time measurements in young people, assisting clinicians, researchers, and medical professionals in making defensible choices about whether to include it in the hemostasis assessment protocol.

THE REFERENCE RANGE FOR BLEEDING TIME

Bleeding time refers to the time it takes for bleeding to stop from a small, standardized skin incision. It is often used as a screening test to assess platelet function, which is important for normal blood clotting. The test involves making a small incision in the skin, typically on the forearm, and measuring the time it takes for the bleeding to stop. This can help diagnose certain bleeding disorders or assess the effectiveness of platelet function. However, it's worth noting that bleeding time tests have become less common in recent years due to the availability of more accurate and reliable tests for assessing platelet function. The bleeding time test is used to assess the function of platelets in the human body. The aim of this project was thus to estimate the sample size required to determine the normal range of bleeding time (BT) in Borujerd (a city in Iran). A pilot study was designed to determine the range of normal BT in a small group of normal people. The total sample size for the next study was then calculated according to the results (Maleki, Roohafza, Rashidi, Aliyari, Ghanavati, Foroughi, Nabatchi, and Torkashvand, 2012).

Many hospitals and health systems have removed the test without any demonstrated harm. In most cases, a thorough history and physical is the only workup needed for the pre-operative assessment of bleeding risk. When the clinical effectiveness of platelet aggregation is desired, a modern platelet function assay can provide the necessary information. This is being increasingly utilized in intracranial hemorrhage on various antiplatelet agents before pooled platelet transfusion (Russeau, Vall, and Manna, 2024). The reference range for bleeding time refers to the normal range of values obtained from a specific test

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used to measure how long it takes for bleeding to stop after a standardized injury, typically a small incision made on the skin. This test is often conducted to assess the overall function of platelets and blood vessels in the clotting process. The typical reference range for bleeding time is around 2 to 7 minutes, but it's essential to recognize that this range can vary depending on the method of testing, the laboratory's protocols, and other factors such as age, sex, medications, and underlying health conditions. In a bleeding time test, assess the rapidness with which the blood can clot and it can stop bleeding. In this test, a small puncture is made in the skin of the person. By performing this test, it can be easily determined how the platelets work together to form clots (Portea Medical, 2022). Here is a breakdown of what the reference range signifies:

Normal Range: The range of values considered typical for individuals without bleeding disorders or other underlying health issues affecting clotting mechanisms. Results falling within this range indicate that the blood's ability to clot is within the expected parameters.

Low Values: Bleeding times shorter than the lower limit of the reference range may indicate increased clotting ability, which could be due to factors such as excessive platelet activity or hypercoagulability. However, extremely short bleeding times can also suggest abnormalities in the testing procedure or the presence of certain medications.

High Values: Bleeding times longer than the upper limit of the reference range may indicate impaired clotting ability, which could be due to factors such as deficiencies in platelets or clotting factors, blood vessel abnormalities, or certain medications that affect clot formation.

The bleeding time is a historical footnote in the archives of laboratory medicine. At the current time, it has been largely discredited and, in part, replaced by other testing. It is included in this collection of other laboratory tests for the convenience of our readers, who may see a reference to the bleeding time in older medical literature (Charbek, 2020).

MATERIALS AND METHODS

Study Design

This was a cross-sectional analytical study

Location of the Study

This study was conducted at the University of Nigeria Enugu Campus (UNEC).

Enugu Campus is located inside Enugu Town, behind Independence Layout, and has just four faculties, as a smaller campus, compared with the Nsukka campus, which happens to be the main campus of the University of Nigeria.

Inclusion Criteria

Healthy subjects between the ages of 18 and 30 years who had signed the informed consent form were recruited into the study.

Exclusion Criteria

Subjects who refuse to give consent and subjects on medications such as anticoagulants, contraceptives, or antiplatelet drugs such as aspirin could impact hemostasis. Participants who refused to participate in the study were exempted.

Sample Size Determination

A total of 200 Subjects were included in the study: 100 males and 100 females.

Study Population

The study population consisted of 200 individuals. All the Subjects were counseled on the purpose of the study, the confidentiality of any information was assured, and the fact that participation in the study was voluntary with the right to opt-out at any point. All the Subjects who gave informed consent were made to sign an already prepaid consent form and recruited into the study.

Ethical Approval

Ethical approval was waived for this study.

Materials

The research instrument for the study was: A structured and pre-tested questionnaire. The information obtained in the questionnaire included sociodemographic data as well as Past Medical and Drug History.

Reagents and Materials

1. Lancets
2. Cotton wool
3. Sphygmomanometer
4. Alcohol
5. Gloves
6. Mobile watches for time monitoring were used.
7. A questionnaire containing personal data, diseases, and conditions related to bleeding time.

METHOD

Ivy's method of bleeding time was followed due to its simplicity with accurate results. A bleeding time test was performed for each volunteer with the following procedures:

i. Tie the BP apparatus cuff around the patient's upper arm and inflate it up to 40 mmHg, which is maintained throughout the test.

ii. Disinfect an area with spirit over the flexor surface of the forearm and allow it to dry.

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iii. Avoid puncturing the superficial veins by making two 3 mm deep punctures 5–10 cm apart using a disposable lancet or surgical blade.
iv. Immediately start the stopwatch.
v. Start counting 15 seconds after the blood comes out to gently wipe off the blood
Repeat the process every similar time till no spot on the filter paper.
vi. Stop the timer, record the duration of each penetration, and determine the average bleeding duration. Express the bleeding time in seconds e.g., 1.10 (one minute& 10 seconds) equals 70 seconds.
The Ivy method for measuring bleeding time is a standardized clinical test used to assess primary hemostasis (platelet function and vascular integrity). It measures how long it takes for a small, controlled skin wound to stop bleeding.

RESULTS

The description of the subjects studied.

A total of 200 subjects who met the inclusion criteria mentioned in the chapter above were recruited into this study after informed consent was obtained from each participant. 200 questionnaires were distributed among the participants at the University of Nigeria, Enugu campus, viral test was done for each participant to ascertain they were healthy. A bleeding time test was done for each participant using Ivy's method. A 100% response rate was recorded.
The age distribution of the participants in the study is shown below in Table 1. The majority of the subjects 97%, were younger than 30 years of age 3% were 30 years of age. The mean age of the respondents is 22.6. The range is 18-30 years.

Table 1: Socio-demographic characteristics of subjects in the University of Nigeria, Enugu campus, 2023. N=200

(a) Age(years)	Frequency	Percentage
Less than 30	95	95
30 years old	5	5

Gender

Sex	Frequency	Percentage
Male	100	50
Female	100	50

Gender = F

BleedingTime[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	5	1	1.0	1.0	1.0
	18	2	2.0	2.0	3.0
	20	1	1.0	1.0	4.0
	22	1	1.0	1.0	5.0
	23	1	1.0	1.0	6.0
	26	4	4.0	4.0	10.0
	27	1	1.0	1.0	11.0
	28	1	1.0	1.0	12.0
	30	1	1.0	1.0	13.0
	33	2	2.0	2.0	15.0
	34	3	3.0	3.0	18.0
	35	1	1.0	1.0	19.0
	38	1	1.0	1.0	20.0
	40	5	5.0	5.0	25.0

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	41	2	2.0	2.0	27.0
	42	2	2.0	2.0	29.0
	43	1	1.0	1.0	30.0
	44	3	3.0	3.0	33.0
	45	1	1.0	1.0	34.0
	46	4	4.0	4.0	38.0
	47	2	2.0	2.0	40.0
	48	1	1.0	1.0	41.0
	49	1	1.0	1.0	42.0
	50	3	3.0	3.0	45.0
	52	2	2.0	2.0	47.0
	53	2	2.0	2.0	49.0
	54	2	2.0	2.0	51.0
	55	1	1.0	1.0	52.0
	58	5	5.0	5.0	57.0
	59	1	1.0	1.0	58.0
	60	5	5.0	5.0	63.0
	61	1	1.0	1.0	64.0
	62	2	2.0	2.0	66.0
	63	2	2.0	2.0	68.0
	64	1	1.0	1.0	69.0
	65	2	2.0	2.0	71.0
	66	1	1.0	1.0	72.0
	67	1	1.0	1.0	73.0
	68	1	1.0	1.0	74.0
	69	2	2.0	2.0	76.0
	70	1	1.0	1.0	77.0
	71	1	1.0	1.0	78.0
	73	2	2.0	2.0	80.0
	74	1	1.0	1.0	81.0
	75	1	1.0	1.0	82.0
	77	1	1.0	1.0	83.0
	83	2	2.0	2.0	85.0
	84	2	2.0	2.0	87.0
	85	1	1.0	1.0	88.0
	87	2	2.0	2.0	90.0
	88	2	2.0	2.0	92.0
	90	1	1.0	1.0	93.0

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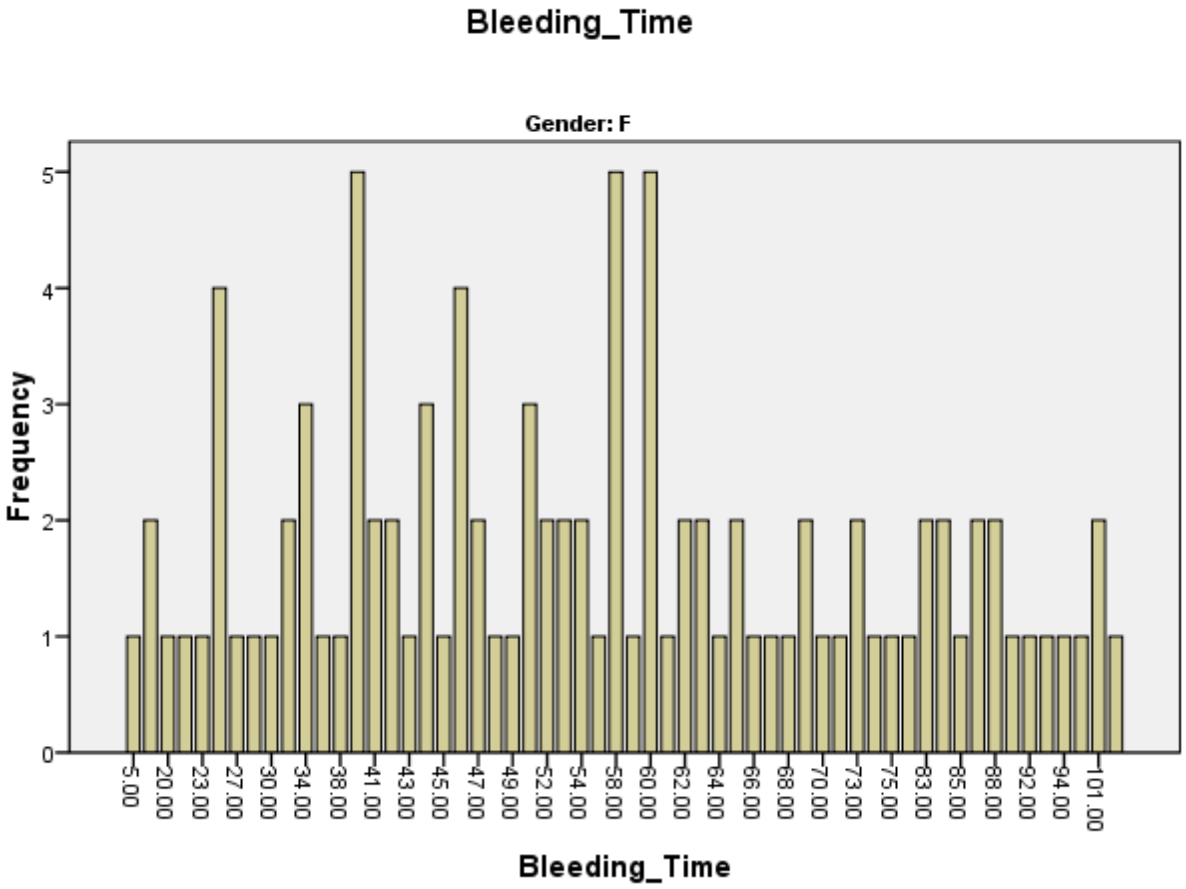
	92	1	1.0	1.0	94.0
	93	1	1.0	1.0	95.0
	94	1	1.0	1.0	96.0
	97	1	1.0	1.0	97.0
	101	2	2.0	2.0	99.0
	130	1	1.0	1.0	100.0
	Total	100	100.0	100.0	

a. Gender = F



Gender = M

Bleeding Time[a]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	10	1	1.0	1.0	1.0
	13	1	1.0	1.0	2.0

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18	2	2.0	2.0	4.0
20	3	3.0	3.0	7.0
23	1	1.0	1.0	8.0
24	1	1.0	1.0	9.0
26	1	1.0	1.0	10.0
27	2	2.0	2.0	12.0
28	2	2.0	2.0	14.0
30	3	3.0	3.0	17.0
31	3	3.0	3.0	20.0
32	2	2.0	2.0	22.0
33	3	3.0	3.0	25.0
34	4	4.0	4.0	29.0
35	5	5.0	5.0	34.0
36	2	2.0	2.0	36.0
37	1	1.0	1.0	37.0
38	3	3.0	3.0	40.0
39	1	1.0	1.0	41.0
40	3	3.0	3.0	44.0
41	1	1.0	1.0	45.0
42	2	2.0	2.0	47.0
43	2	2.0	2.0	49.0
44	1	1.0	1.0	50.0
45	4	4.0	4.0	54.0
46	2	2.0	2.0	56.0
47	1	1.0	1.0	57.0
49	2	2.0	2.0	59.0
50	2	2.0	2.0	61.0
52	2	2.0	2.0	63.0
53	2	2.0	2.0	65.0
54	1	1.0	1.0	66.0
55	4	4.0	4.0	70.0
57	1	1.0	1.0	71.0
58	2	2.0	2.0	73.0
59	2	2.0	2.0	75.0
60	2	2.0	2.0	77.0
62	1	1.0	1.0	78.0
64	1	1.0	1.0	79.0
65	2	2.0	2.0	81.0

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	67	1	1.0	1.0	82.0
	69	1	1.0	1.0	83.0
	72	2	2.0	2.0	85.0
	75	4	4.0	4.0	89.0
	79	1	1.0	1.0	90.0
	90	2	2.0	2.0	92.0
	91	1	1.0	1.0	93.0
	95	1	1.0	1.0	94.0
	100	3	3.0	3.0	97.0
	109	1	1.0	1.0	98.0
	118	1	1.0	1.0	99.0
	134	1	1.0	1.0	100.0
	Total	100	100.0	100.0	

a. Gender = M

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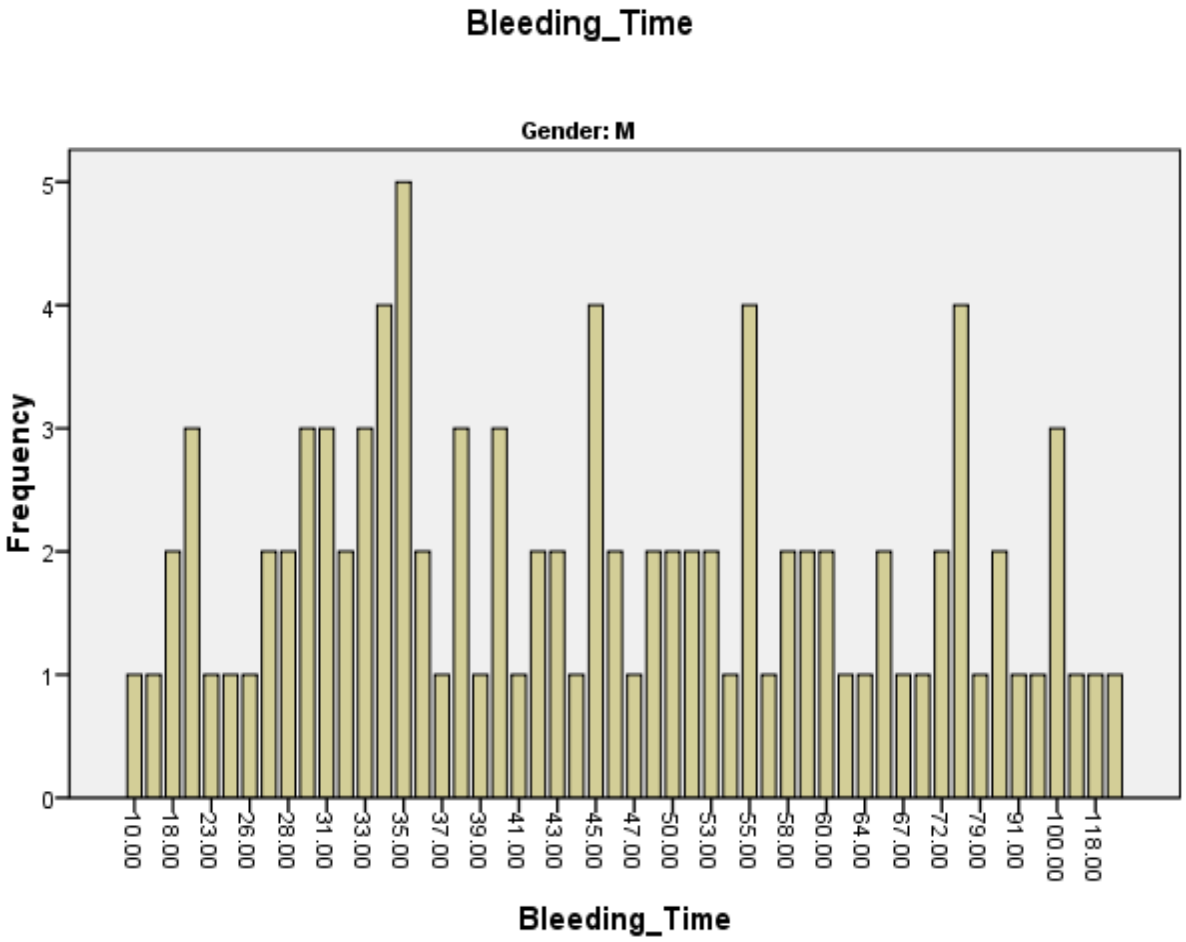

Table 3: Descriptive Statistics for Bleeding Time and Platelet Count among young individuals concerning gender variation

	Bleeding Time		
		Reference Range	
Gender	Mean±Std.Dev	Minimum	Maximum
Male	49.50±23.68	10.00	134.00
Female	55.93±22.37	5.00	130.00
	Platelet count		
		Reference Range	
	Mean±Std.Dev	Minimum	Maximum
Male	212.52±59.06	84.00	364.00
Female	245.57±69.29	42.00	439.00

RESULTS

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From the result above the mean of bleeding time for the females was found to be 55.93 seconds, with the standard variation of +/- 2.24, therefore the reference range for female bleeding time is 55.93. For the male, the mean bleeding time is 49.50 seconds, the standard variation is +/- 2.4 and the reference range is 49.5 seconds.

1. Bleeding Time:

Male:

- Mean Bleeding Time: 49.50 seconds
- Standard Deviation: 23.68 seconds
- Minimum Bleeding Time: 10.00 seconds
- Maximum Bleeding Time: 134.00 seconds

Female:

- Mean Bleeding Time: 55.93 seconds
- Standard Deviation: 22.37 seconds
- Minimum Bleeding Time: 5.00 seconds
- Maximum Bleeding Time: 130.00 seconds

The "Bleeding Time" test measures the time it takes for blood to stop flowing after a small incision is made.
The average bleeding time for males is approximately 49.50 seconds, with a relatively wide range from 10.00 seconds to 134.00 seconds.
For females, the average bleeding time is slightly longer at approximately 55.93 seconds, with a range from 5.00 seconds to 130.00 seconds.

Platelet Count:

Male:

- Mean Platelet Count: 212.52 x 10^9/L (platelets per liter)
- Standard Deviation: 59.06 x 10^9/L
- Minimum Platelet Count: 84.00 x 10^9/L
- Maximum Platelet Count: 364.00 x 10^9/L

Female:

- Mean Platelet Count: 245.57 x 10^9/L
- Standard Deviation: 69.29 x 10^9/L
- Minimum Platelet Count: 42.00 x 10^9/L
- Maximum Platelet Count: 439.00 x 10^9/L

The "Platelet Count" test measures the concentration of platelets in the blood, typically reported in billions per liter (x 10^9/L). The average platelet count for males is approximately 212.52 x 10^9/L, with a range from 84.00 x 10^9/L to 364.00 x 10^9/L. For females, the average platelet count is slightly higher at approximately 245.57 x 10^9/L, with a range from 42.00 x 10^9/L to 439.00 x 10^9/L. It's critical to keep in mind that these values fall within reference ranges, which denotes that they are typical for healthy people of different genders. However, these results should be taken into account along with other clinical data and patient-specific considerations in individual health assessments. Therefore, the reference is stated below:
For **Bleeding Time:** Male Reference Range: 10.00 to 134.00 seconds Reference Range: 5.00 to 130.00 seconds.
For **Platelet Count:** Male Reference Range: 84.00 x 10^9/L to 364.00 x 10^9/L_ Female Reference Range: 42.00 x 10^9/L to 439.00 x 10^9/L

DISCUSSION

The findings show that bleeding time varies widely in healthy individuals and is influenced by many factors; environmental and genetic factors contribute to this variation. The findings further show that bleeding time can be prolonged in conditions such as von Willebrand disease, thrombocytopenia, hemophilia, platelet dysfunction, medications like NSAIDs, etc. The test is used in clinical practice to evaluate platelet function, which can assist in identifying whether there is an issue with blood clotting. It can also be used to keep track of how well specific drugs or therapies are working. Bleeding time is influenced by things like pre-analytical conditions, laboratory procedures, and quality control. Although these variables might not have a direct effect on the reference ranges, they might cause incorrect results. In Nigeria, there are currently no current national bleeding time reference values. Relying on reference ranges that have been verified in other adult groups may be deceptive and detrimental to patient care. According to Charbek and MD, FCCP (2020), the normal bleeding time using Ivy's method is 60-540 seconds. According to research by Mount Sinai (2023), normal bleeding time is 60-540 seconds using the Ivy method.
Variations in bleeding times have been noted when comparing studies from different African countries and referring to established bleeding time ranges from Western cultures. Similarly, variations in bleeding time reference values within Nigeria are a result of changes in research population size, geographic location, and technique. From the result, Males bleeding time is 49.50 seconds on average, which is within the reference range. Also, male

have 212.52 x 109/L platelet count, which is likewise within the guideline range.

The study further shows that females' bleeding time is 55.93 seconds on average, which is significantly longer than males' on average but still within the standard range. Females have a platelet count of 245.57 x 109/L, which is likewise within the normal range. While platelet count is an important contributor to blood clotting and can affect bleeding time, it is only one aspect of the intricate process of hemostasis. Bleeding time can also be affected by other variables, including platelet function and blood clotting factor levels. Therefore, a thorough assessment of a person's bleeding tendency would involve considering multiple factors and clinical history.

The study further shows that population differences may exist in the length of the bleeding period, which may be impacted by the method of testing, genetic, environmental, and demographic factors. Establishing precise reference ranges that are unique to the Nigerian population is crucial, especially for young adults, as these ranges are crucial diagnostic tools for evaluating bleeding diseases and general health. This study has established a precise reference range for bleeding time amongst young Nigerian adults.

CONCLUSION

It emerges from this study that healthy young Nigerian people fall outside the Western population's reference range for bleeding time. The difficulty in setting diagnostic thresholds for bleeding time diseases can be largely attributed to this variation within the normal distribution. For young Nigerian adults in the Enugu metropolis, this study has filled a gap in the bleeding time reference ranges for young Nigerian adults. This research has the potential to advance medical understanding in the field of bleeding disorders, enhance healthcare outcomes, and raise patient care standards. Based on the findings of this research, the following suggestions were made: This topic needs additional research using a wide range of subjects. This study has to be carried out in other Nigerian States.

Author contributions

Blessing and Favour contributed equally to this study.

Data availability

There is no data stored in any repository.

List of abbreviations

No abbreviations to declare

Conflict of interest

No conflict of interest exists between the author and anyone.

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