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# Assessment of Some Haemostatic Factors in Elderly People in Keffi, Nasarawa State, Nigeria

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***Authors' contributions***

*This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.*

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## ABSTRACT

**Aim** The aim of the study is to inform the scientific and local community on the effects of ageing on hemostatic parameters in Keffi, Nasarawa state and also improve care for the elderly.
**Study Design:** The study was a case-control descriptive study. The study was designed to assess the some haemostatic factors in elderly people in Keffi, Nasarawa State.
**Place and Duration of the Study:** The study was conducted in Federal Medical Center Keffi, Nasarawa State-Nigeria. Data collection spanned a specific duration from November, 2022 to January, 2023.
**Methodology:** Prothrombin time (PT), activated partial thromboplastin time (APPT), clotting time (CT), bleeding time (BT) and International normalised ratio (INR) are few of the coagulation profiles

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that were examined in 100 geriatrics living in Keffi, Nasarawa state, Nigeria. The age range used is from 60 and above. While 50 young adults between the age of 18 to 35 were used as control subjects. The tests for prothrombin time and activated partial thromboplastin time were carried out using CA-1500 (Sysmex, Kobe, Japan), with appropriate quality control materials and standard reagents (Dade Behring, Germany). While Lee and White method was employed for clotting time. The bleeding time (BT) was performed by Ivy's modified template method.

**Results:** Prothrombin time, activated partial thrombin time and international normalize ratio among geriatrics showed significant variations ($p < 0.05$), when compared with the control subjects. In contrast, it was found that the bleeding time was longer in the control subjects than in the test participants.

**Conclusion:** The findings of this research suggest that ageing has a significant effect on hemostatic factors when compared to younger subjects.

*Keywords: Haemostatic factors; geriatrics; keffi; coagulation studies.*

## 1. INTRODUCTION

A broad physiological process called ageing affects both the components of tissues and the systems that make up cells. As people get older, yellow inactive marrow gradually replaces red bone marrow [1]. One of the largest and busiest organs in the human body, red marrow produces all different types of blood cells. As people age, their platelet counts, some coagulation factors, and serum calcium levels decline, this results in prolonged clotting times [2]. Haemostasis is a process that stops bleeding, preventing blood from leaking out of broken blood vessels. When the integrity of blood vessels is compromised, haemostasis serves to stops the bleeding, otherwise the resulting blood loss can cause shock and death [3]. Aging causes changes in coagulation factors, thrombin production, and platelet activity, which lead to alterations in hemostasis. Age increases platelet activation and some coagulation factors, including fibrinogen, factor VII, VIII, IX, XI, XIII, and von Willebrand factor (VWF), in addition, fibrinolytic activity decreases with ageing [2]. It should be noted that this does not result in hypercoagulability, as this increase in some coagulation factors seems to be compatible with ageing [4]. To initiate haemostasis, a vascular spasm that prompts the blood arteries to close down to prevent excessive blood loss, then platelets plugs are produced, which bind together to provide a temporary closure to conceal the vessel wall rupture and finally coagulation involving several plasma proteins form a clot [5]. Clots develop when fibrinogen becomes fibrin and is then added to the platelet plug. Fibrin threads are used in coagulation to bind the sticky platelets together [6]. Many people who are otherwise healthy exhibit laboratory evidence of an increase in coagulation enzyme activity and plasma concentration of some clotting factors as they age [3,7]. A common test for assessing the extrinsic coagulation pathway (fibrinogen, prothrombin, V, VII, and X) is the prothrombin time (PT) assay. The problem of significant variation in PT results between laboratories was addressed by the introduction of the International normalised ratio (INR), which has been used to standardize PT value. Anticoagulant therapy has been monitored using a variety of techniques, INR being the gold-standard [1]. A screening test for the absence of factors II, V, VIII, IX, X, XI, and XII of the intrinsic and common pathways is the activated partial thromboplastin time (aPTT) [8]. A biological amplification mechanism called clotting is involved in the process by which a small number of initiating chemicals sequentially activate a cascade of circulating precursor proteins [7]. The Clotting time is affected by the integrity of the coagulation pathway and platelet quantity and function. The time taken for blood to clot in a plain sample container is measured as the clotting time. The bleeding time (BT) test, which measures how long it takes for bleeding to stop after an incision, is the first test used to evaluate platelet function and primary hemostasis [1]. While normal BT typically lasts between 2 and 10 minutes, acute platelet shortage can fatally prolong the BT [9]. BT is impacted by a number of variables, including skin temperature, exercise, anxiety, incisions that are longer than usual, and intensive cleaning of the test area [9]. Various researchers have demonstrated that the length of bleeding time shortens with age, racial diversity, and geographic location. Determining the typical bleeding time for each geographic area is therefore required [10]. White blood cell (WBC) and red blood cell (RBC) count, chronic kidney disease, anemia, and connective tissue disorders are other factors that could lengthen bleeding

duration. Additionally, certain foods, vitamins, and spices like ginger, curcuma, onion, vitamins E and C, and garlic might cause aberrant platelet aggregation and prolonged bleeding times [11]. The processes of coagulation and fibrinolysis are strongly genetically regulated. Individual variations in blood coagulation protein levels are influenced by genetic factors [12]. In both hypertension and normotensive patients, higher systolic and diastolic blood pressure has been demonstrated to be correlated with PT and APTT elevation [13]. Owing to the fact that hypertension, is common in the elderly, it is imperative that coagulation parameters are periodically evaluated as a preventive measure [14].

While there are available publications showing how ageing affects coagulation factors, little of such research has been done in Nigeria and none at all in Keffi, Nasarawa state. Despite considerable amount of data published concerning the coagulation status of the geriatrics, clinicians are still confronted with the problem of “Normal” or “physiological” values in these subjects. Hence the need to assess hemostatic parameters among the male and female geriatrics residing in Keffi, Nasarawa Nigeria. This study may also serve as a reference point for future study on other similar research work and may serve as a moving force towards conducting a similar research in a different locality.

## 2. METHODS

### 2.1 Study Area

This research work was carried-out within Keffi metropolis and Federal Medical Center Keffi, Nasarawa state.

### 2.2 Sample Size

A total of 150 subjects, with appropriate clinical findings and laboratory confirmation were used for this study. One hundred (100) were used as test subjects while the remaining fifty (50) as control subjects. The systematic sampling technique was used to recruit the subjects.

### 2.3 Study Population and Design

Geriatrics subjects, both male and female that are apparently healthy and at age sixty (60) and above whose inform consent was obtained for test control and younger adults between the age of 18 to 35 for control where included. While, geriatrics subjects and younger adults with apparent disease conditions were excluded. The study was a case-control descriptive study.

### 2.4 Sample Collection

Six milliliters (6mls) of venous blood was collected with a 10ml syringe and 21G needle, 2.25 ml of the blood was dispensed into 0.25ml of sodium citrate in a sample bottle (9 parts of blood and 1 part of trisodium citrate) for prothrombin test (time and INR) and activated partial prothrombin test (time). It was mixed immediately and centrifuged for 1500g to obtain a plasma poor in platelet.

### 2.5 PT and APTT Determination

PT and APTT were carried out using CA-1500 (Sysmex, Kobe, Japan), with appropriate quality control materials and standard reagents (Dade Behring, Germany). The INR was calculated as patients’ PT divided by control PT.

### 2.6 Clotting Time Determination

Three milliliters were used for clotting time (Lee and white method), 1ml of blood was added in 3 different plain tubes fixed in a rack previously placed in a water bath at a temperature of 37ºC, each bottle was tilted to check for the sign of blood clot every 30 sec. using a stop watch, the time interval between blood collection and the time the clot appears in each test tube was recorded in minutes. The average of the three reading was taken as the clothing time for each subject.

### 2.7 Bleeding Time Determination

The bleeding time (BT) was performed by Ivy's modified template method, sphygmomanometer cuff was used to wrap around the upper arm and inflated to a pressure of 40mms of mercury and maintained throughout the test. The forearm was cleansed with alcohol pad and allowed to dry. Skin punctures was made on the anterior side avoiding superficial vein. The stop watch was started immediately the first puncture was made. The blood from the wound was then removed at regular intervals (15-30secs) using the edge of a filter paper making sure the wound was not touched. The time taken for each wound to stop bleeding was noted separately and the average time taken.

## 2.8 Statistical Analysis

Statistical analyses were conducted using IBM SPSS 25 software, and results was expressed in simple percentages, mean ± standard deviation. The hypothesis was tested using the student T-test. Results were presented in tables.

## 3. RESULTS

Tables 1-3 shows the demographic data (gender, ethnicity and education respectively) of the study participants. The study participants are majorly males in both control and test groups. Aguta, alago, egon gwandara, gbagyi, kanuri, tiv are the dominant tribes in the test subjects, while kanuri and igbo tribes make up the bulk of the control subjects. The majority (74%) of the test subjects have at least secondary school education while all the control subjects have tertiary education.

**Table 1. Demographic Data (Gender)**

| Gender | Control | Test | Percentage (%) |
|---|---|---|---|
| Male | 33 | 68 | 68 |
| Female | 17 | 32 | 32 |

**Table 2. Demographic Data (Ethnicity)**

| Ethnicity | Control | Test | Percentage (%) |
|---|---|---|---|
| Aguta | 0 | 13 | 13 |
| Alago | 1 | 12 | 12 |
| Basa | 1 | 9 | 9 |
| Calabar | 1 | 0 | 0 |
| Ebira | 1 | 9 | 9 |
| Egon | 1 | 11 | 11 |
| Gbagyi | 1 | 11 | 11 |
| Gwandara | 1 | 12 | 12 |
| Hausa | 19 | 0 | 0 |
| Igbo | 20 | 0 | 0 |
| Kauri | 1 | 11 | 11 |
| Tiv | 0 | 12 | 12 |
| Yoruba | 3 | 0 | 0 |

**Table 3. Demographic Data (Education)**

| Education | Control | Test | Percentage (%) |
|---|---|---|---|
| None | 0 | 26 | 26 |
| Primary | 0 | 0 | 0 |
| Secondary | 0 | 44 | 44 |
| Tertiary | 50 | 30 | 30 |

Table 3 shows the level of education of the participants, 26% of the participants have no education background, while 44% of the participants have attained the level of secondary education, and also 30% of the participants have attained the level of tertiary education.

Table 4 shows the mean values of the test parameters; The mean value of the age control group was (27.0 ± 0.65) and (72.1 ± 0.60) for the test group. Significant variations were observed in the mean values of other test parameters; an increase was seen in the mean value of PT from (12.36 ± 0.27) in the control subjects to (15.33 ± 0.45) in the test subjects. The mean value of APTT was lower (28.50 ± 0.93) in the control group when compared to (39.37 ± 1.38) in the test subjects. There was also an elevation in the mean value of INR in the test group (1.39 ± 0.07) compared to the control group (1.03 ± 0.04). The mean value of the clotting time was observed to have increased from (10.19 ± 0.25) in the control group to (11.18 ± 0.14) in the test subjects. Conversely, a decrease was observed in the mean value of the bleeding time of the control group from (2.59 ± 0.09) to (2.21 ± 0.07) in the test group.

There was significant increase ($p<0.05$) in the mean values of the test groups of PT, APTT, INR and clotting time when compared with the control groups. However, there was a significant decrease ($p<0.05$) in the mean value of the test group of bleeding time when compared with the control group.

**Table 4. Mean values of PT, APTT, INR, clotting time and bleeding time in the control group and test group in Keffi, Nasarawa state**

| Variables | Control | Test | t-value | p-value |
|---|---|---|---|---|
| Age (Years) | 27.0 ± 0.65 | 72.1 ± 0.60 | -46.726 | 0.0001 |
| Prothrombin Time (Seconds) | 12.36 ± 0.27 | 15.33 ± 0.45 | -5.066 | 0.0001 |
| Activated partial thromboplastin time (Seconds) | 28.50 ± 0.93 | 39.37 ± 1.38 | -7.073 | 0.0001 |
| International normalized ratio | 1.03 ± 0.04 | 1.39 ± 0.07 | -3.715 | 0.001 |
| Bleeding time (Minutes) | 2.59 ± 0.09 | 2.21 ± 0.07 | 3.278 | 0.001 |
| Clotting time (Minutes) | 10.19 ± 0.25 | 11.18 ± 0.14 | -2.207 | 0.029 |

## 4. DISCUSSION

A study on the effect of age on PT, APTT, and INR on male and female above 60 years in Owerri, found that the geriatric values were higher than the young adult values, which were used as controls [15]. This study assessed some haemostatic factors among geriatrics in Keffi, Nasarawa state, Nigeria. According to the findings of this research, the mean value in PT, aPTT and INR of the control group was significantly lower ($p < 0.05$) than the test group. This finding is in agreement with finding of Eledo et al. [15] who reported that the elderly and control subjects pro-thrombin time was 15.07 seconds and 11.89 seconds, respectively for females According to [16], the increase of PT, INR, and aPTT in geriatrics, suggests a decrease in the common pathway coagulation factors and/or a qualitative or quantitative fibrinogen defect as age progresses. An increase in activated partial thromboplastin time and pro-thrombin time may be an indication of decline in the common pathway coagulation factor (factor X, V, and II) and /or defects in qualitative or quantitative fibrinogen due to ageing [17].

Additionally, coagulation is a factor in clotting time. However, platelet count and activity control the intricate mechanism that determines how long clots last. A decrease in platelets will undoubtedly cause the clotting time to be delayed. Age-related platelet counts decline and inactivity are the causes of the delayed clotting time seen in elderly patients [16].

In contrast, it was found that the bleeding time was longer in the control participants than in the test subjects. This result was consistent with what [18] reported in a related study.

## 5. CONCLUSION

In conclusion, when compared to the controls employed, the geriatrics showed significantly higher PT, APTT, INR and clotting time, while the bleeding time (BT) was significantly lower when compared to control group.

## CONSENT

All authors unanimously declare that written informed consent was obtained from the participants for publication of this study finding.

## ETHICAL APPROVAL

Ethical clearance was obtained from the constitutional review board ethics and committee of Federal Medical Centre Keffi, Nasarawa State. Confidentiality and privacy were ensured through Federal Medical Centre Keffi.

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## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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