

# Prothrombin Time Activated Partial Thromboplastin Time and Platelets Count among Hypertensive Patients Attending a Tertiary Health Institution in Yenagoa, Nigeria

Benjamin Onyema Eledo<sup>1,2</sup>, Sylvester Chibueze Izah<sup>3\*</sup> and Okezie Caleb Okamgba<sup>4</sup>

<sup>1</sup>Department of Medical Laboratory Science, Madonna University, Elele, Nigeria

<sup>2</sup>Department of Hematology and Blood Transfusion, Federal Medical Centre, Bayelsa State, Nigeria

<sup>3</sup>Department of Biological Sciences, Niger Delta University, Bayelsa State, Nigeria

<sup>4</sup>Department of Medical Laboratory Science, Abia State University, Abia State, Nigeria

\*Corresponding author: Izah SC, Department of Biological Sciences, Niger Delta University, Bayelsa State, Nigeria, Tel: +2347030192466; E-mail: chivestizah@gmail.com

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## Abstracts

This study investigated the hemostatic status of some hypertensive patients. Blood samples were collected from 15 males and 17 females known hypertensive patients between 42-63 years attending the general out-patient clinic of the Federal Medical Centre Yenagoa. Another 21 non-normotensive subjects between 18-40 years served as the controls. All the subjects gave their consent. Prothrombin time activated partial thromboplastin time and platelets counts were determined following standard protocols. Results for hypertensive patients and control subjects were 15.49 seconds and 11.79 seconds, respectively for males and 15.32 seconds and 11.88 seconds, respectively for females (prothrombin time); 35.47 seconds and 28.57 seconds, respectively, for males and 34.18 seconds and 29.05 seconds respectively, for females (activated partial thromboplastin time);  $191.07 \times 10^9$  /L and  $268.67 \times 10^9$  /L respectively, for males and  $189.47 \times 10^9$  /L and  $274.81 \times 10^9$  /L respectively, for females (platelets count). There were significant variations ( $P < 0.001$ ) between the hypertensive and control subjects for each of the parameters. The variation suggests possible hemostatic system dysfunction with regard to coagulation and thrombosis. Hence there is need for early diagnosis to avoid hemostatic complications and to aid effective management of the patients.

**Keywords:** Coagulation; Hemostatic system; Hypertension; Thrombosis

## Introduction

Like cardiovascular diseases, hypertension is a major global health issue. Hypertension is among the emerging causes of mortality and morbidity in the world [1]. Hypertensive patients usually have their systolic and diastolic blood pressures increased. Adaye et al. [2] described hypertension as one of the global diseases accounting for about 9.4 million deaths per annum. According to MacGill [3], blood pressure usually exerted on the blood vessels walls, and the pressure depends on the work being carried out by the heart and resistance of the blood vessels. In 2017, American Heart Association defined hypertension as a medical condition in which the blood pressure is higher than 130 over 80 millimeters of mercury (mmHg) [3]. Adaye et al. [2] also reported that hypertension is a condition in which the blood pressure is indubitably higher than 140 over 90 mmHg.

Several factors contribute to the prevalence of hypertension. Some of the notable causes of high blood pressure include diets, life style, stress and other medical conditions. Jiskani et al. [1], Adaye et al. [2] also reported that environmental and genetic factors/ family history, body weight (obesity), age, gender, alcohol abuse and life style are some of the essential in hypertension development with regard to its severity. World Health Organization suggested that growth on processed food industry has affected global salt concentration in diets that plays a role in hypertension [3].

Hemostatic system is involved in atherosclerotic processes, and hypertension is one of the atherosclerotic risk factor that causes endothelial dysfunction [2]. Unmanaged hypertension case could enhance the risk of heart disease, stroke, and other medical problems. Some of the notable symptoms of hypertension include chest pain, tightness or pressure in the chest, persistent cough, fatigue, ankle/leg swelling, loss of appetite, shortness of breath, pain in the neck, back, arms, or

shoulders [4]. But the symptoms depend on severity of the condition and progression of the disease [4].

Hypertension is one of the leading causes of cardiovascular diseases in the world [1]. Furthermore, diseases like atherosclerosis could be caused due to abnormal and lopsided coagulation of the blood following myocardial infarction and cerebral hemorrhage [1,5,6]. This typically occurs over a prolong period of time among individual that did not sought for treatment early.

Several blood parameters are used to assess hemostatic function viz: platelets count, Prothrombin time and activated partial thromboplastin time etc., Platelets are essential in maintaining hemostasis and sufficient number are needed to maintain normal function [7]. Platelets are also involved in series of complex morphological and biochemical variations when activated [7]. Dysfunction of the platelets may lead to pulmonary hypertension and pulmonary thromboembolism [8]. The authors further noted that pulmonary hypertension is a common denominator in all pulmonary disorders that could lead to core pulmonale. Pulmonary hypertension is attributed to vasoconstriction, disruption of alveolar septae and possibly due to polycythemia and hyperkinetic circulation [8]. Pulmonary thrombosis could be complicated among hypertensive patients [7].

The synthesis of coagulation factors is vital in hemostasis functioning [9]. According to Abdollahi et al. [10], Miljic et al. [11], Jiskani et al. [1], some basic coagulation parameters are used to ascertain the role of coagulation factors in both extrinsic and intrinsic blood coagulation. Mature stage of hypertension could be deleterious. As such assessment of certain parameters is essential in managing coagulation and hemostatic deviations [1]. Furthermore, Jiskani et al. [1] reported that coagulation abnormalities often manifest as atherosclerosis among hypertensive patients and it could lead to life threatening situations [1].

Hypertensive patients are known to be at an increased risk of thrombotic diseases, especially vascular and coronary artery diseases [1,12]. Furthermore, hemostatic dysfunctions and coagulopathy are some of the frequently encountered complications associated with hypertension [1]. Frequent assessment of prothrombin time and activated partial thromboplastin time are essential to determine procoagulant pathways [9,13], coagulopathies and monitoring of anticoagulant drug therapy [14]. Hence this study focused on blood platelets, Prothrombin time and activated partial thromboplastin time among hypertensive patients attending Federal Medical Centre, Yenagoa, Bayelsa state, Nigeria.

## Materials and Methods

### Study area

Yenagoa metropolis is within Yenagoa local government area of Bayelsa state. The region lies in sedimentary basin and fishing is one of the major occupations of natives of the area [15]. Like other Niger Delta region, the area has a relative

humidity of 50-95% and atmospheric temperature of  $28 \pm 5^\circ\text{C}$  all year round [16-20].

### Criteria for selection of subjects

**Inclusion criteria:** A total of 32 known hypertensive patients comprising of 15 males and 17 females within the age of 42-63 years attending the general out-patient clinic of the Federal Medical Centre Yenagoa with informed consent participated in this study. Twenty-one (21) normotensive subjects between 18-40 years served as the controls. The systolic and diastolic blood pressures of the participants were confirmed by the consultant physician in charge of the unit.

**Exclusion criteria:** Individuals with known cases of clotting and bleeding disorders, pregnant subjects; those suffering from hepatitis B and C, tuberculosis, diabetes, HIV-1 and HIV-2 and those that refused consent were excluded from the study.

### Blood collection

The blood samples were collected following standard venipuncture technique previously described by Eledo et al. [21-24]. Approximately 5 ml of blood was collected from each subject. About 2.25 ml of blood was dispensed into a plastic tube containing 0.25 ml of trisodium citrate for prothrombin time and activated partial thromboplastin analysis, while the remain sample was dispensed into dipotassium EDTA bottles containing 1.5 mg/ml of blood of the anhydrous salt for platelets count analysis.

### Laboratory analysis

The prothrombin time and activated partial thromboplastin time were analyzed following the method previously described by Eledo et al. [23,24]. The prothrombin time and activated partial thromboplastin time Kits used has Lot numbers: 52601003 and 52602001 respectively and were supplied by Agappe Diagnostics Switzerland. The blood platelets counts were evaluated using Cronkit's ammonium oxalate method.

### Statistical analysis

Statistical Package for Social Science version 20.0 was used for statistical analysis. Descriptive statistics data were expressed as mean  $\pm$  standard error, while significant variation was at  $P=0.05$ . It was carried out using Student "t" test.

## Results and Discussion

**Tables 1 and 2** present the hemostatic parameters results of hypertensive male and female patients, respectively attending Federal Medical Centre, Nigeria. In hypertensive patients and control, the prothrombin time was 15.49 sec and 11.79 sec respectively for males (**Table 1**), 15.32 sec and 11.88 sec respectively for females (**Table 2**); the activated partial thromboplastin time was 35.47 sec and 28.57 sec respectively for males (**Table 1**), 34.18 sec and 29.05 sec respectively for females (**Table 2**), and study blood platelets was  $191.07 \times 10^9/\text{L}$

and  $268.67 \times 10^9 /L$  respectively for males (**Table 1**),  $189.47 \times 10^9 /L$  and  $274.81 \times 10^9 /L$  respectively for females (**Table 2**). There was significant variation ( $P < 0.001$ ) between the hypertensive and control candidates for each of the parameters. The variation suggests shift among the hemostatic parameters under study. Typically, a significant increase in both parameters suggests the tendency to cause an alteration in the hemostatic system [1]. Dysfunction of hemostatic system predispose the patients to atherosclerosis which a major risk factor of hypertension together with endothelial destruction and dysfunction, and hyper activation of the platelet [1].

**Table 1** Effect of hypertension on some hemostatic parameters in males.

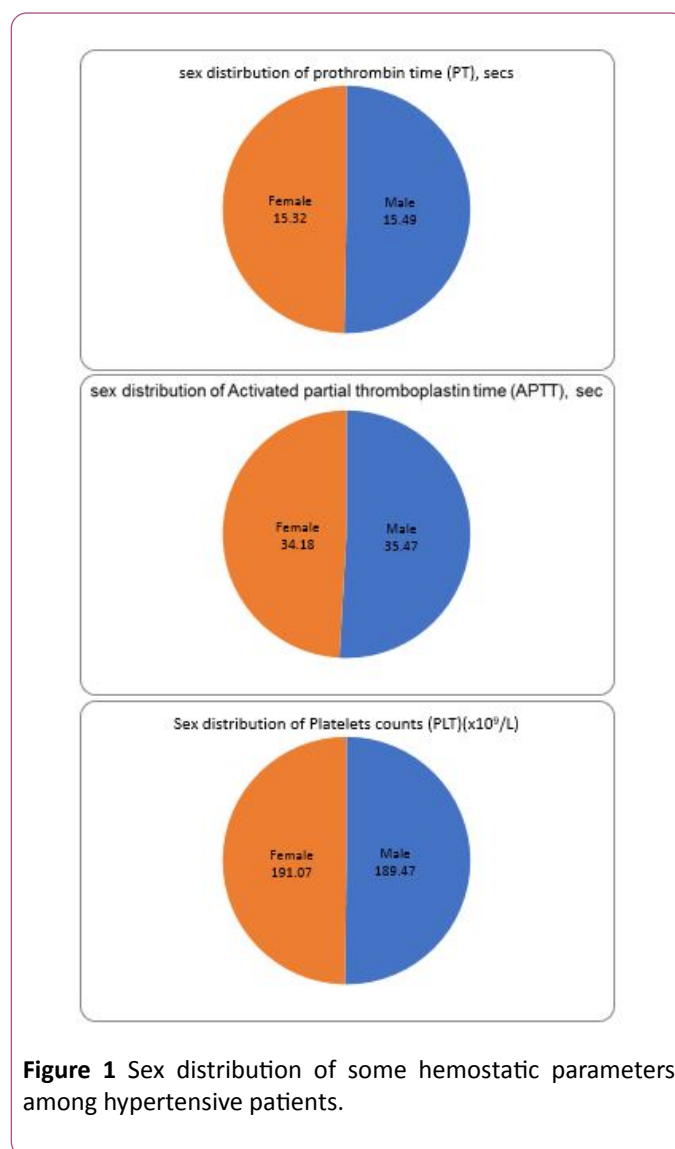
Parameters	Mean $\pm$ Standard error		t-value	P-value
	Subjects (n=15)	Control (n=21)		
Prothrombin time (PT), secs	15.49 $\pm$ 0.30	11.79 $\pm$ 0.18	11.147	0
Activated partial thromboplastin time (APTT), sec	35.47 $\pm$ 0.51	28.57 $\pm$ 0.63	8.039	0
Platelets counts (PLT) ( $\times 10^9 /L$ )	191.07 $\pm$ 9.28	268.67 $\pm$ 11.50	-4.952	0

**Table 2** Effect of hypertension on some hemostatic parameters in females.

Parameters	Mean $\pm$ Standard error		t-value	P-value
	Subjects (n=17)	Control (n=21)		
Prothrombin time (PT), secs	15.32 $\pm$ 0.21	11.88 $\pm$ 0.27	9.568	0
Activated partial thromboplastin time (APTT), sec	34.18 $\pm$ 0.38	29.05 $\pm$ 0.62	6.679	0
Platelets counts (PLT) ( $\times 10^9 /L$ )	189.47 $\pm$ 6.12	274.81 $\pm$ 11.15	-6.281	0

Based on **Figure 1**, the platelets count and prothrombin time which were apparently higher in females in this study were not in consonance with the work of Nwovu et al. [7] that reported that males had relatively higher platelets counts and prothrombin time among hypertensive patients.

Basically, prothrombin time, activated partial thromboplastin time are coagulation parameters [24,25]. Furthermore, platelets are essential for the initiation and propagation of thrombosis [24]. Nwovu et al. [7] reported that prolonged prothrombin time and platelet count were predominant with increased ageing among hypertensive patients. The authors attributed this decline to prostacyclin production.



**Figure 1** Sex distribution of some hemostatic parameters among hypertensive patients.

Based on Comparison, Jiskani et al. [1] reported prothrombin time (11-19 seconds hypertensive patients and 11-14 seconds control) and activated partial thromboplastin time (30-46 seconds hypertensive patients and 25-34 seconds control) in Pakistan Institute of Medical Sciences, Islamabad. Aadaeze et al. [2] reported prothrombin time (14.45 seconds hypertensive patients and 13.60 seconds control), and partial thromboplastin time test kaolin (35.42 seconds hypertensive patients and 32.56 seconds control) among hypertensive patients attending University of Calabar Teaching Hospital, Calabar, Cross River State. Nwovu et al. [7] reported platelets count ( $286.33 \times 10^9 /L$  hypertensive patients and  $238.20 \times 10^9 /L$  control) and prothrombin Time (15.53 seconds hypertensive patients and 13.60 seconds control) among hypertensive patients attending clinic in Federal Teaching Hospital Abakaliki.

The trend of prothrombin time and activated partial thromboplastin time observed in this study is comparable to the findings of Jiskani et al. [1], Aadaeze et al. [2], Nwovu et al. [7]. Furthermore, platelet counts showed a contrary trend with the findings of Nwovu et al. [7]. However, slight variation in the values of this study compared to previous studies could be

associated with duration of hypertension, age, gender and antihypertensive drugs being used [1].

## Conclusion

Prothrombin time and activated partial thromboplastin time in hypertensive individuals provide useful information about hemostatic functions and hypercoagulation, while blood platelets are essential parameters used in assessing thrombosis. This study found a significant elevation in the hemostatic parameters under study viz, platelets counts, prothrombin time and activated partial thromboplastin time among hypertensive patients. This suggests the need for early intervention on hypertensive patients for appropriate management so as to avoid complications associated with coagulation and thrombosis.

## Authors Contribution

Author BOE conceived the idea, involved in sample collection and laboratory analysis. Author SCI managed literature search carried out the statistical analysis and wrote the initial draft. Author OCO proof read the manuscript. All authors approved the manuscript.

## Ethical Consideration

Permission was obtained from the ethics committees of the Medical Laboratory Science Department of Madonna University, Elele, Nigeria and Federal Medical Centre Yenagoa, Nigeria. Informed consent was obtained from the patients prior to sample collections.

## Conflict of Interest

There were no conflicts of interest.

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