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**Relationship between Blood Pressure, Pulse Rate, Body Weight and Some Human Blood Groups among Stroke Subjects of Ogoni Ethnic Group**Evelyn Mgbeoma Eze<sup>1</sup>, Serekara Gideon Christian<sup>\*1</sup> and Ibiere Allwell Pepple<sup>1</sup>*Department of Medical Laboratory Science, Faculty of Science, Rivers State University, Nkpulu-Oroworukwo, PMB 5080, Port-Harcourt, Rivers State, Nigeria<sup>1</sup>.**Author for Correspondence\*: serekara.christian1@ust.edu.ng***Abstract**

The aim of this study was to *compare blood pressure, pulse rate, body weight, some blood group antigens (Lewis and ABO) among individuals of Ogoni ethnic group with stroke*. This was a cross-sectional study carried out among indigenes of Ogoni whose first generational parents are natives of Ogoni. A total of 100 participants (49 females and 51 males), within the age of 30 – 60 years were recruited for the study using convenient sampling technique. Participants were recruited from Ogoni. The Ogonis are an ethnic group of people located in an area along the Niger Delta Eastern edge, to the north-east of the Imo River and the city of Port Harcourt. Ogoniland covers about 1036 Sq Km and borders the Bay of Guinea. Bori town was specifically the city for sampling and it is located on latitude: 4° 40' 34.64 N and longitude: 7° 21' 54.68 E. Blood Pressure, weight and pulse measurements were done on site. Blood group phenotyping was carried out at the Post Graduate Laboratory of Rivers State University, Nkpulu-Oroworukwo, Port Harcourt, Rivers State, Nigeria. All subjects were recruited the same day and their blood samples collected on 2nd October, 2019, and analysis conducted on 3rd October, 2019. Measurement of blood pressure, pulse rate was done using a Sphygmomanometer while body weight was measured using a weighing scale. Determination of Lewis-a blood group was carried out using Anti-Le<sup>a</sup> monoclonal, prepared by Lorne Laboratories Ltd, UK (Lot No: 63207-A3). Furthermore, determination of Lewis-b blood group was carried out using Anti-Le<sup>b</sup> monoclonal, prepared

by Lorne Laboratories Ltd, UK (Lot No: 63190-A3). Determination of ABO Blood Groups were carried out using Anti-A, Anti-B, Anti-AB IgD/IgM Blend Reagents, Atlas Medicals, Cambridge-UK. Phenotyping of red cells was done using tube method as described by Lorne Laboratories. The systolic blood pressure in stroke group was significantly higher ( $p < 0.0001$ ) than the systolic blood pressures of control participants in control blood group A, B, and O, Also, the systolic blood pressure of stroke group was significantly higher ( $p = 0.0021$ ) than in Le<sup>a</sup> control blood group; and also, significantly higher than in Le<sup>b</sup> control blood group ( $p = 0.0194$ ). For diastolic blood pressure, there was statistically significant increase in stroke group upon comparison with control groups of blood group B ( $p = 0.0130$ ). For pulse rate, there was statistically significant increase in stroke group when compared with control groups of blood group Le<sup>b</sup> ( $p = 0.0337$ ). Body weight was significantly higher among the stroke group when compared with control groups who were blood group O, ( $p = 0.0265$ ). The study has revealed that subjects in the stroke group had systolic and diastolic blood pressure that falls under the classification of high blood pressure, and so they were hypertensive, which is a risk factor for the occurrence of stroke. Individuals in stroke group were also overweight, which is also another risk factor for being hypertensive and in turn a risk factor for stroke. Conclusively, the studied blood groups (A, B, O, Le<sup>a</sup>, and Le<sup>b</sup>) are not associated with increase in blood pressure, pulse rate and body weight and as such are not risk factors for stroke.

**Keywords:** Blood pressure, Pulse rate, Body weight, Stroke, Lewis blood group, ABO blood group.

## Introduction

It is a known fact that individuals that are hypertensive are at risk of having thrombosis in blood vessels that supplies blood to the cerebral region of the brain and also at risk of having cerebral haemorrhage, hence the need to also find out the variability of blood pressure in control subjects based on their blood group and compare it with the finding in stroke group. In line with this quest, systolic and diastolic blood pressure and pulse rate were determined in the study population.

It has been reported that most persons who had a first stroke, also had been reported to have had high blood pressure (HBP or hypertension) (American Heart Foundation, 2016). High blood pressure is capable of damaging the arteries in the body, creating situations where they cause the arterial vessels to easily clog or burst. Arteries that have been weakened in the brain as a result of high blood pressure increases the risk for stroke; therefore, managing high blood pressure is very critical in reducing the risk of having stroke (American Heart Foundation, 2016).

According to Ganong (2005), hypertension can be defined as a sustained elevation of the systemic arterial pressure. The arterial pressure is flagged/determined by peripheral resistance and cardiac output; the peripheral output is in turn determined by the blood viscosity and also by the resistance of the blood vessel. According to the American Heart Foundation, (2016) the following are the blood pressure category: (i) Normal: systolic pressure of < 120 mmHg and diastolic pressure of < 80 mmHg; (ii) Elevated: systolic pressure of 120-129 mmHg and diastolic pressure of < 80 mmHg; (iii) Hypertension Stage One: systolic pressure of 130 – 139 mmHg or diastolic pressure of 80 – 89 mmHg; (iv) Hypertension Stage Two: systolic pressure of 140 mmHg or higher or diastolic pressure of 90 mmHg or higher; (v) Hypertensive crisis: systolic pressure of > 180 mmHg and/or diastolic pressure of > 120 mmHg.

One of the leading modifiable risk factors for stroke is an elevated blood pressure and the benefit of therapy aimed at lowering blood pressure will help in stroke risk reduction. The optimal blood pressure target for preventing the occurrence of stroke are somewhat controversial, but there are evidences from epidemiological studies and randomized controlled trials that has given credence to the fact that intensive blood pressure lowering is beneficial for a well and greater vascular protection, in order to prevent stroke (Hong, 2017).

Pulse rate is the measurement of the number of times the heart beats in a minute and according to Roper (1999), the normal pulse for an adult is 70 to 80 bpm. Body weight refers to an individual's weight or mass and it is measured in kilogram.

The ABO blood group system has an International Society of Blood Transfusion [ISBT] symbol or number which is ABO [001]. When ISBT first described the nomenclature in 1982, five ABO antigens were mentioned, but now, ABO5 is obsolete after H antigen was moved to form the H blood group system in the year 1990 (Reid and Lomas-Francis, 2003). Among Africans, the distribution of ABO blood groups is B:20%; A:27%; AB:4% and O:49% (Fang *et al.*, 2013). Christian *et al.* (2018a); Christian *et al.* (2018b); and Okoroiwu *et al.* (2015), reported occurrence of ABO blood group in some ethnic groups of Nigeria, in the order of O>A>B>AB. The ABO blood group is a risk factor for venous thrombosis and embolism (Fang *et al.*, 2013).

The Lewis blood group system has its ISBT gene name as LE (FUT3) and has been given the ISBT symbol and number to be LE (007) and its associated antigens are: Le<sup>a</sup>, Le<sup>b</sup>, Le<sup>ab</sup>, Le<sup>bh</sup>, ALe<sup>b</sup> and BLe<sup>b</sup> (Reid *et al.*, 2012). The Lewis blood group system was discovered by Mourant in 1946 (Reid *et al.*, 2006). The common phenotypes are: Le<sup>a+b-</sup> [Le<sup>a</sup>]; Le<sup>a-b+</sup> [Le<sup>b</sup>]. The frequency distribution of Le<sup>a</sup> in Blacks is 23 %, while the frequency distribution of Le<sup>b</sup> in Blacks is 55 % (Reid *et al.*, 2006). The Lewis antigens, are structures synthesized by the exocrine epithelial cells that are absorbed passively into red cell bilayers and some group of Lewis

antigens function as counter ligands for selectins Foxall *et al.* (1992); which is consistent with the association of Lewis antigens in the causation of thrombotic events (Clark *et al.*, 2005). Lewis antibody Le<sup>a</sup> and Le<sup>ab</sup> occur as IgM in nature (Reid *et al.*, 2006).

Stroke is one of the abnormal health conditions common among the elderly and of recent, quite a number of young adults that are being affected have been documented (Christian *et al.*, 2016). Despite the advances in medicine and medical research, some educated persons in Nigeria still attribute the occurrence of stroke to be as a result of some “diabolical manipulations” forgetting that disease conditions have their pathogenesis which can be medically underpinned to some biophysiological and haemostatic derangement in the body system and the blood in particular (Christian *et al.*, 2016).

Stroke which is one of the many cerebrovascular diseases, is now common with a strong devastating impact on persons that are affected by it, and stroke, can be termed as a cerebrovascular accident, which has been defined as a sudden or abrupt onset of a neurologic deficit attributed to a main or focal cause in the vasculature (Smith *et al.*, 2015). The resultant effect is cerebral ischaemia (which is the reduction of blood supply or blood flow to the brain that is known to last beyond many seconds), if the loss of blood supply to the brain exceed more than 120 seconds, death of tissues in the brain or infarction may occur (Smith *et al.*, 2015). Stroke has been said to be the second main cause of death globally, with a documented 6.2 million deaths in the year 2011 (Smith *et al.*, 2015). The prevalence rate of stroke in Nigeria is 1.31 % (Sanya *et al.*, 2015), and stroke alone causes about 200,000 deaths in the United States of America and it has also been reported that it is the major cause of disability amongst the Americans (Smith *et al.*, 2015).

Stroke can be ischaemic or haemorrhagic. It is ischaemic when there is thrombus formation in the veins that supplies blood to the brain and it is haemorrhagic when there is bleeding that causes an aneurism. If the stroke is ischaemic, administration of recombinant tissue 2 plasminogen activator (rtPA) or endovascular

mechanical thrombectomy may be beneficial in restoring cerebral perfusion (Smith *et al.*, 2015). It should be noted also that in haemorrhagic stroke, there are two important main causes: hypertensive intracerebral haemorrhage and aneurysmal subarachnoid haemorrhage (Smith *et al.*, 2015; Ganong, 2005).

## Material and Methods

### Study Design

This is a convenient cross-sectional study carried out among indigenes of Ogoni whose first generational parents are natives of Ogoni.

### Study Area

Participants were recruited from persons of Ogoni ethnic group. The Ogonis are an ethnic group of people located in an area along the Niger Delta Eastern edge, to the north-east of the Imo River and the city of Port Harcourt. Ogoniland covers about 1036 Sq Km and borders the Bay of Guinea. Bori town was specifically the city for sampling and it is located on latitude: 4° 40' 34.64 N and longitude: 7° 21' 54.68 E. Blood Pressure, Weight and Pulse measurements were done on site. Blood group phenotyping was carried out at the Post Graduate Laboratory of Rivers State University, Nkpolu-Oroworukwo, Port Harcourt, Rivers State, Nigeria. Port Harcourt is located on latitude 4.75°N and longitude 7.00°E (Encyclopedia.com, 2019).

### Study Population

A total of 100 participants (49 females and 51 males), within the age of 30 – 60 years were recruited for the study using convenient sampling technique. Twenty-three (23) subjects were stroke subjects, the control groups were made up of 30 participants from blood group O, 13 participants from blood group B, 15 participants of blood group A, 11 participants from Lewis-a blood group and 8 participants from Lewis-b Blood group. All control participants were apparently healthy.

### Blood Sample Collection

The venous blood obtained from each participant was drawn from the vein at the antecubital fossa with the use of a vacutainer tube and needle as described by Cheesebrough. Two (2.0) mL of venous blood was collected into the vacutainer tube containing 0.5 mL of 1.2 mg/mL

dipotassium EDTA. It was well mixed for the serological identification of ABO, Le<sup>a</sup> and Le<sup>b</sup> blood groups. Blood samples were analyzed within 24 hours of collection.

**Methodology**

Determination of Lewis-a Blood Group Using Anti-Le<sup>a</sup> Monoclonal, Lorne Laboratories Ltd, UK. Lot No: 63207-A3; Expiry Date: 2021/03/11

**Method: Tube method.**

Tube method was used to phenotype red cells as described by Lorne Laboratories (2018a). Three percent (3 %) red cell suspension was prepared using isotonic saline. One volume of Lorne Anti-Le<sup>a</sup> reagent was added to one volume of the prepared 3 % red cell suspension and properly mixed and incubated for 15 minutes at room temperature before being centrifuged for 20 seconds at 1000 g. The red cell button was gently re-suspended and read macroscopically for the presence of agglutination. Presence of agglutination is indicative of a positive result while on the contrary, a negative result is indicative of absence of agglutination.

Determination of Lewis-b Blood Group Using Anti-Le<sup>b</sup> Monoclonal, Lorne Laboratories Ltd, UK. Lot No: 63190-A3; Expiry Date: 2021/03/20

**Method: Tube method.**

Tube method was used for phenotyping of red cells as described by Lorne Laboratories (2018b). Three percent [3 %] red cell suspension was prepared using isotonic saline. One volume of Lorne Anti-Le<sup>b</sup> reagent was added to one volume of the prepared 3 % red cell suspension

and properly mixed and incubated for 15 minutes at room temperature before being centrifuged for 20 seconds at 1000 g. The red cell button was gently re-suspended and read macroscopically for the presence of agglutination. Presence of agglutination is indicative of a positive result while on the contrary, a negative result is indicative of absence of agglutination.

**Determination of ABO Blood Groups Using Anti-A, Anti-B, Anti-AB IgD/IgM Blend Reagents, Atlas Medicals, Cambridge-UK.**

Phenotyping of red cells was carried out manually using standard tube techniques as described by Judd (1994) and Brecher (2002). For ABO a drop of anti-A, anti-B, and anti-AB each was placed in scrupulously cleaned test tubes labelled 1, 2, 3, which contained a drop of 5 % washed red blood cell suspension made in saline. The contents were gently mixed and then centrifuged for about 30 seconds at 1000 g. The cell buttons were re-suspended and then observed for the presence of agglutination. Agglutination of the tested red cells constituted a positive result for the blood group.

**Statistical Analysis**

Data collected was statistically analyzed by the use of Graph-Pad Prism Statistical package for determination of mean, standard deviation and p-values. A p-value less than 0.05 was considered statistically significant.

**Results**

**Demographic Details of Study Population.**

A total of 100 participants (49 females and 51 males), within the age of 30 – 60 years were recruited for the study using convenient sampling technique. Details are shown in Table 1.

**Table 1 Demographic Characteristics of Study Population.**

Parameters	Frequency	Percentage (%)
Total number of subjects in the study	100	100
Total number of males in the study	51	51
Total number of females in the study	49	49
Age range (years)	30 - 60	-
No. of subjects that were educated	100	100

**Blood Pressure, Pulse Rate and Body Weight in the Study Population**

The diastolic and systolic blood pressure, pulse rate and body weight in the study population were obtained. The mean ± standard deviation of their respective values based on differences in blood groups were compared with that of stroke group. For systolic blood pressure, there was statistically significant difference between stroke group upon comparison with the control groups based on differences in blood group at  $p < 0.001$ . All blood groups in control groups showed statistically significant differences. The systolic blood pressure in stroke group was significantly higher ( $p < 0.0001$ ) than the systolic blood pressures of control participants in control

blood group A, B, and O, Also, the systolic blood pressure of stroke group was significantly higher ( $p = 0.0021$ ) than in  $Le^a$  control blood group; and also significantly higher than in  $Le^b$  control blood group ( $p = 0.0194$ ). For diastolic blood pressure, there was statistically significant increase in stroke group upon comparison with control groups of blood group B,  $p = 0.0130$ . For pulse rate, there was statistically significantly increased in the stroke group when compared with control groups of blood group  $Le^b$ ,  $p = 0.0337$ . For body weight, statistically significant increase was observed in stroke group when compared with control groups of blood group O,  $p = 0.0265$ . Details are shown in Tables 1 to 5.

**Table 2: Comparison of Mean ± Standard Deviation of Vital Signs in Stroke Group and Control Blood Group A**

Parameters/Unit	Stroke (N = 23) mean ± SD	Blood Group A (N = 15) mean ± SD	p-value
Systolic Pressure [mmHg]	150.0 ± 24.25	126.4 ± 10.15	<0.0001(HS)
Diastolic Pressure [mmHg]	91.35 ± 11.81	82.13 ± 8.43	0.0761 (NS)
Pulse [bpm]	79.70 ± 12.26	71.00 ± 7.18	0.0633(NS)
Weight [Kg]	66.39 ± 11.97	58.87 ± 10.37	0.1458(NS)

**Key:** HS = Highly Significant; NS = Non-significant; S = Significant; VS = Very Significant. Note: Applicable to all Tables.

**Table 3: Comparison of Mean ± Standard Deviation of Vital Signs in Stroke Group and Control Blood Group B**

Parameters/Unit	Stroke (N = 23) mean ± SD	Blood Group B (N = 13) mean ± SD	p-value
Systolic Pressure [mmHg]	150.0 ± 24.25	126.1 ± 8.56	<0.0001(HS)
Diastolic Pressure [mmHg]	91.35 ± 11.81	79.38 ± 6.44	0.0130(S)
Pulse [bpm]	79.70 ± 12.26	72.00 ± 8.09	0.1668(NS)
Weight [Kg]	66.39 ± 11.97	58.23 ± 10.77	0.1199(NS)

**Table 4: Comparison of Mean ± Standard Deviation of Vital Signs in Stroke Group and Control Blood Group O**

Parameters/Unit	Stroke (N = 23) mean ± SD	Blood Group O (N = 30) mean ± SD	p-value
Systolic Pressure (mmHg)	150.0 ± 24.25	127.3 ± 17.35	<0.0001(HS)
Diastolic Pressure [mmHg]	91.35 ± 11.81	84.64 ± 12.92	0.1262(NS)
Pulse [bpm]	79.70 ± 12.26	74.03 ± 11.05	0.1902(NS)
Weight [Kg]	66.39 ± 11.97	58.72 ± 8.81	0.0265(S)

**Table 5: Comparison of Mean ± Standard Deviation of Vital Signs in Stroke Group and Control Le<sup>a</sup> Blood Group**

Parameters/Unit	Stroke (N = 23) mean ± SD	Blood Group Le <sup>a</sup> (N = 11) mean ± SD	p-value
Systolic Pressure (mmHg)	150.0 ± 24.25	129.6 ± 13.33	0.0021(VS)
Diastolic Pressure [mmHg]	91.35 ± 11.81	81.27 ± 6.71	0.0813(NS)
Pulse [bpm]	79.70 ± 12.26	79.09 ± 13.19	0.9998(NS)
Weight [Kg]	66.39 ± 11.97	58.64 ± 10.86	0.2031(NS)

**Table 6: Comparison of Mean ± Standard Deviation of Vital Signs in Stroke Group and Control Le<sup>b</sup> Blood Group**

Parameters/Unit	Stroke (N = 23) mean ± SD	Blood Group Le <sup>b</sup> (N = 8) mean ± SD	p-value
Systolic Pressure (mmHg)	150.0 ± 24.25	131.3 ± 12.60	0.0194(S)
Diastolic Pressure [mmHg]	91.35 ± 11.81	87.50 ± 14.88	0.9658(NS)
Pulse [bpm]	79.70 ± 12.26	68.00 ± 6.845	0.0337(S)
Weight [Kg]	66.39 ± 11.97	56.38 ± 8.48	0.0969(NS)

**Discussion**

The mean systolic blood pressure for subjects in the stroke group in this study was high upon comparison with the mean systolic blood pressure in all the control groups, with a statistically significant difference of  $p < 0.0001$ , when compared with control subjects of blood group A, blood group B and blood group O. Upon comparison with the Lewis control blood groups of Le<sup>a</sup> and Le<sup>b</sup>, the p-value was  $p = 0.0021$

and  $p = 0.0194$  respectively. This implies that the medically established fact that increase in systolic blood pressure is a predisposing factor for stroke occurrence is true for subjects recruited in this study. The high systolic blood pressure (150.0 ± 24.25 mmHg) in this study upon comparison with that of other researchers indicated that there was agreement with the study of Weiss *et al.* (2013), where they observed a mean systolic blood pressure of 150.7 ± 24.2

mmHg in all stroke patients. This high systolic blood pressure is associated with the risk of high mortality rate noticed amongst stroke patients. The systolic blood pressure in this study is also similar to that reported by Yong and Kaste (2008), Soares *et al.* (2011), where they reported systolic blood pressure that was greater or equal to 140 mmHg in stroke patients. According to Hong (2017), persons with systolic blood pressure of less than 130 mmHg are at a lower risk of having stroke when compared with persons having 130 to 140 mmHg, and those having systolic blood pressure of greater than 140 mmHg. Comparing our findings with values obtained from the control groups, it implies that those in the control groups had values less than 130 mmHg of systolic blood pressure and therefore have a lower risk of having stroke. So, the presence of these ABO and Lewis blood group antigens may not be associated as a factor that could cause increase in systolic blood pressure and by extension, cardiovascular and thrombotic events.

For diastolic blood pressure, there was statistically significant increase in stroke group upon comparison with control groups of blood group B ( $p = 0.0130$ ). The mean diastolic blood pressure in stroke group in this study was  $91.35 \pm 11.81$  mmHg which was high, higher than that reported by Weiss *et al.* (2013), where they reported a mean diastolic blood pressure level of  $77.6 \pm 15.06$ ; but similar to the findings of Yong and Kaste (2008), where they reported diastolic blood pressure level greater or equal to 90 mmHg among younger adults in Europe who suffered stroke. Jauch *et al.* (2013), reported an elevated blood pressure in persons diagnosed with acute ischaemic stroke, and that the blood pressure was higher in patients with history of hypertension. Individuals in the stroke group reported persistence of high blood pressure before they suffered stroke and they were hypertensive. From our study, the diastolic blood pressure of the control groups was normal and as such could not be a risk factor for cardiovascular and thrombotic events.

The systolic and diastolic blood pressure in persons in stroke group indicates that their overall blood pressure was high and this agrees

with the report of Jauch and Colleagues. Decrease in blood systolic and diastolic pressure (20 mmHg decrease in systolic blood pressure and 10 mmHg decrease in diastolic blood pressure) has been associated with a two-fold decrease in stroke mortality according to Lewington *et al.* (2002); this supports the finding in this research that stroke was enhanced as a result of high blood pressure as can be seen from the mean value of systolic and diastolic blood pressure in stroke group; and also agrees with the medical literature by Hong (2017), that high blood pressure is associated with an increased risk of stroke, as well as high death rate as a result of stroke. Furthermore, based on blood group, Hajizaden *et al.* (2016), reported that non-blood group O individuals had systolic blood pressure that was higher than what was recorded in blood group O individuals, but with no statistically significant difference. In this study, there were close variations in systolic blood pressure upon comparison of blood group A, B and O of the control groups, and this finding was not exactly the same with their finding, in that blood group O was higher in this study (blood group A:  $126.4 \pm 10.15$  mmHg; blood group B:  $126.4 \pm 8.56$  mmHg; blood group O:  $127.3 \pm 12.35$  mmHg) than in the study of Hajizaden and Colleagues (non-blood group O:  $119.31 \pm 1.50$ ; blood group O:  $117.26 \pm 3.28$ ). Similar finding to systolic blood pressure was observed in this study when diastolic blood pressure of blood group O subjects was compared. Blood group O subjects had diastolic blood pressure that was higher than non-blood group O subjects, which is not in agreement with the observations made by Hajizaden and Colleagues.

Individuals with abnormal heart beat are at the risk of having stroke according to American Academy of Neurology, (2019). The mean pulse rate of stroke group in this study was  $79.70 \pm 12.26$  bpm, which is within the normal rate. Upon comparison, there was statistically significant increase in stroke group when compared with control groups of blood group Le<sup>b</sup> ( $p = 0.0337$ ). Other control groups of the study showed no statistically significant difference. According to Harvard Medical School, measuring pulse rate can help prevent atrial fibrillation and by extension, stroke (Harvard

Medical School, 2014). The implication of this is that, individuals with a normal pulse rate devoid of other stroke risk factors will have a lower risk for stroke. Although in this study, the mean pulse rate in stroke group was normal but it was at the upper limit for normal pulse rate compared to the control groups. The mean values of pulse rates in blood groups A, B, O and Le<sup>b</sup> were higher than that of Le<sup>b</sup>. The normal pulse rate in the stroke group may be as a result of intake of their medications after their regular clinical visits, on weekly basis.

In this study, mean body weight was higher in stroke group than in the control groups. There was a statistically significant increase of mean body weight in stroke group when compared with control groups of blood group O ( $p = 0.0265$ ). Being overweight is a risk factor for ischaemic stroke although it can be controversial, but according to the study of Cho *et al.* (2019), subjects who undergo weight change had an increased risk for ischaemic stroke (Cho *et al.*, 2019). Based on the findings in this study, increase in body weight in stroke group compared to the control groups is an indicator that increase in body weight can be a contributory risk factor for stroke.

### Conclusion

The study showed that subjects in the stroke group had systolic and diastolic blood pressure that falls under the classification of high blood pressure (hypertensive), which is a risk factor for the occurrence of stroke. Individuals in the stroke group were also overweight, which is also another risk factor for being hypertensive and in turn a risk factor for stroke. Conclusively, the studied blood groups (A, B, O, Le<sup>a</sup>, and Le<sup>b</sup>) are not associated with increase in blood pressure, pulse rate and body weight.

### Consent and Ethical Approval

Informed consent was obtained from all participants subjects prior to enrolment upon approval by the Department of Medical Laboratory Science, Rivers State University, Port Harcourt.

### Competing Interests

Authors have declared that no competing interests exist.

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