*Original Research Article*

# RELATIONSHIP OF VISCERAL OBESITY AND BMI WITH BLOOD PRESSURE AMONG OSUN STATE COLLEGE OF EDUCATION STAFF, NIGERIA


## ABSTRACT

**Aims:** To determine prevalence of visceral obesity, compare association of visceral obesity to Blood Pressure (BP) with association of Body Mass Index (BMI) to BP.

**Study design:** Research was a cross-sectional survey study design.

**Place and Duration of Study:** The study took place in Osun State College of Education, Ilesa, Osun State, Nigeria, between November 2015 and April 2016.

**Methodology:** We included 231 members of staff. A semi-structured instrument (questionnaire) was used for data collection. Waist circumference was measured with a measuring tape. BMI was measured with a weighing scale and stadiometer. BP levels were determined with electronic sphygmomanometer. Data collected were analyzed using Statistical Package for Social Science (SPSS) version 21.

**Results:** There were 117 (50.7%) male and 99 (42.9%) female participants between the ages of 26 and 66 years. The results revealed that the prevalence of visceral obesity was high (71.4%) among the respondents while prevalence of 88.9% was recorded among the female participants. Dietary pattern of respondents was poor (35.16%), it was significantly associated with the development of visceral obesity [$R^2$ = 0.190; F = 7.47; $P$ < .001]. Social pressure from immediate family, was detected to be significantly associated with respondents' intention towards reducing visceral obesity [$R^2$ = 0.166; F = 45.704; $P$ < .01]. Findings also revealed that visceral obesity was significantly associated with BP [$R^2$= 0.155; F = 20.989; $P$ < .01] and also significantly associated with BMI [$R^2$= 0.044; F = 5.235; $P$ = 0.006].

**Conclusion:** Visceral obesity was more significantly associated with high BP than BMI; hence visceral obesity was a more accurate predisposing risk factor than BMI, in predicting susceptibility to hypertension. This study will improve health promotion, while creating awareness about visceral obesity.



*Keywords: Abdominal obesity, hypertension, cardiovascular diseases, visceral obesity and BMI*


## 1. INTRODUCTION

Obesity affected up to 33% of the industrialized world population [1]. It was stated that chronic diseases accounted for 24% of all deaths in Nigeria with cardiovascular disease accounting for 7% of this [2]. As at 2005, only 29% of men were overweight and 39% of women were overweight. The prevalence of overweight was predicted to increase in both men and women, to 39% and 49% respectively by 2015 [3].

Researches have revealed different risk factors of cardiovascular disease (CVD), among which was obesity. Abdominal obesity was the type of obesity revealed to be an important factor to diabetes and other cardiovascular diseases as they are unique pathogenic fat depot [4-5]. The risk of CVD has been revealed to be strongly associated with Visceral Adipose Tissue, measurable using waist circumference [6]. Visceral fat distribution has been associated with higher prevalence or incidence of CVD influencing the need for waist circumference measurement to estimate the full impact of the worldwide obesity epidemic [7-8].

There are two different depots of abdominal fat: the intra-abdominal (visceral) obesity (excess fat in the abdominal cavity) and abdominal subcutaneous fat (the fat located just under the skin). It is believed that they serve as energy sink, where excess energy is stored. The inability of the subcutaneous adipose tissue to store the excess energy due to elevated visceral fat, may cause the fat to move and accumulate at undesired locations like the heart, liver and muscles (ectopic fat deposition) thereby increasing the risk of CVD [9-10].

The combination of cardio-metabolic risk factors are referred to as 'Metabolic syndrome (MetS); and in 2005, the American Heart Association proposed that any 3 of the following 5 criteria constitute diagnosis of MetS: elevated BP, elevated waist circumference, elevated triglycerides, reduced High Density Lipoprotein cholesterol and elevated fasting glucose [11], this was further reviewed by the International

Diabetes Federation (IDF) and a new definition was established, concluding that for an individual to be defined as having the MetS, they must have visceral obesity plus any two of the remaining four risk factors [12]. Elevated waist circumference (visceral obesity) has been proven to be an independent risk factor for some chronic diseases: type 2 diabetes mellitus, CVD (hypertension, coronary artery disease, and stroke), kidney cancer, non-alcoholic fatty liver disease (NAFLD) [13-15].

Body mass index has been identified by the World Health Organization as the most useful epidemiological measure of obesity. It is nevertheless a crude index that does not take into account the distribution of body fat, resulting in variability in different individuals and populations [16]. In determining waist circumference for visceral obesity, there is variability according to ethnicity and nationality; the International Diabetes Federation established a standard waist circumference according to ethnicity and waist circumference of less than 94cm and less than 80cm was recommended for male and female of sub-Saharan African region respectively [17]. (Table 1)

in our community diagnosis of the members of staff of the institution, it was discovered that there is a steady increase in the incidence rate of hypertension, many of these members of staff adhere to medications in managing the condition but however, it was discovered there was minimum number of these individuals with excess body mass but rather elevated abdominal cavity, posing a possible relationship between hypertension and abdominal cavity elevation amongst this community of people as revealed by Despres *et al* that it is possible that some obese patients, with lower-than-expected visceral fat may not have clinical signs of CVD, whereas patients who may be moderately overweight with higher-than-expected visceral fat have metabolic profile that may predispose them to CVD as disease risk are more closely related with visceral fat rather than the total body fat volume [10]. In the assessment of obesity, the central distribution of body fat cannot be overlooked, hence, the use of other anthropometric indices such as WC and WHR, as measures of adiposity and it has been indicated that waist circumference is a better measurement of body weight in association with CVD than BMI [16, 18]. A further study [19] revealed that Waist Circumference is a superior anthropometric measurement in diagnosing MetS to both Waist Hip Ratio and BMI using both NCEP and WHO criteria.

There has been a reported rise in prevalence of obesity in sub-Saharan African countries especially in sub-urban populations [20]. The rise has been revealed to be attributed to physical inactivity, unhealthy weight gain behaviors, increased sedentary nature, intake of high caloric fast food and sugar sweetened beverages, relative household wealth and decreased mental health [21-24].

Urbanization is a critical factor that has influenced the traditional ideal body image among Africans, who have always been inclined towards a larger, fuller body shape as obesity was also associated with dignity, health, wealth and respect in view of the “big is beautiful” mindset [25-26]. Obesity has been revealed to be particularly common among urban women [27].

Researches have been carried out in Nigeria to evaluate the prevalence of obesity, with results indicating 10.5% prevalence of obesity in Remo local government [28], another research [23] revealed 62.2% prevalence of obesity among nurses in Akwa Ibom state. Also a 49.34% prevalence of obesity was recorded among the Kalabaris in the Niger Delta region of South-South Nigeria [29].

**Table 1: Values of waist circumference according to ethnicity [17]**

| ETHNICITY | WAIST CIRCUMFERENCE VALUE | |
|---|---|---|
| **European** | Male | >94 cm |
| | Female | >80 cm |
| **South Asians** | Male | >90 cm |
| | Female | >80 cm |
| **Chinese** | Male | >90 cm |
| | Female | >80 cm |
| **Japanese** | Male | >85 cm |
| | Female | >90 cm |
| **South and Central Americans** | Male | >90 cm |
| | Female | >80 cm |
| **Sub Saharan Africans** | Male | >94 cm |
| | Female | >80 cm |
| **Eastern Mediterranean and Middle East** | Male | >94 cm |
| | Female | >80 cm |

Obesity is one of the strongest predictor of hypertension [30]. An increase in rate of obesity subsequently leads to high prevalence of cardiovascular diseases such as high BP, diabetes and stroke.
Some studies have revealed that some ethnic groups in Africa historically preferred overweight women and embraced cultural practices that encouraged female obesity and attribute it to health and beauty [31], our society nowadays encourages overweight and obesity as it is seen as a sign of wealth [25-26]. This study aims at increasing awareness on the association of visceral obesity with BP and also to advocate for the use of waist circumference measurement in evaluating obesity.
This research will determine prevalence of visceral obesity, compare visceral obesity and BMI's association with BP in the study area. Results of this study will enhance early diagnosis of hypertension and its control.

## 2. MATERIAL AND METHODS

Participants were drawn from members of staff of the Osun State College of Education (OSSCOED) Ilesha, all participants reside in Ilesa community and work at the institution. They were within an age range of between 20 and 70 years. This choice of respondents were made because of the increasing prevalence of high BP among members of staff of the institution.
Random sampling method was used in selecting the participants for this study. Sample proportion was drawn using Cochran's formula [32]:

$$n_0 = \frac{Z^2pq}{e^2}$$

Z = 1.96 (confidence level at 95%)
p = 0.8 (estimated proportion of attribute)
q = 0.2 (1-p)
e = 0.05 (level of precision)

The sample size was approximated to 250 participants. This was done to take care of attrition, in order to account for loss or missing questionnaires (instrument).

### 2.1 Instruments for data collection

The instrument for data collection in this study was a self-developed questionnaire, measuring tape, weighing scale, stadiometer and sphygmomanometer. The measuring tape was used in measuring the waist circumference of individuals in centimeter (cm) with cutoff points of 94cm for male and 80cm for female; the weighting scale and stadiometer was used in measuring weight and height of respondents which was used in calculating respondents' BMI in unit value of kilogram per meter square ($kg/m^2$) with cutoff points of above $30kg/m^2$ as obese based on a study by Ghazali *et al.* [19] and the sphygmomanometer was used in measuring the BP of respondents with cutoff points at 130 mmHg and 85 mmHg for systolic BP (SBP) and diastolic BP (DBP) based on guidelines from the European School of Hypertension and European school of Cardiology [33].
The questionnaire evaluated participants' demographic factors, three multiple answers questions measured respondents' knowledge of visceral obesity, six questions measured attitude on visceral obesity and eight questions measured subjective norms on visceral obesity both measured on a 5-point likert scale of Strongly Agree (SA), Agree (A), Undecided (U), Disagree (D) and Strongly Disagree (DS), six questions measured perceived behavioral control on visceral obesity reduction and seven questions measured behavioral Intention and dietary pattern both measured on a 2-point likert scale of 'yes' and 'no'. Seven questions measuring dietary pattern of respondents was also assessed, measured on a 5-point rating scale of Never (N), Not Sure (NS), Small Proportion (SP), Medium Proportion (MP) and Large Proportion (LP).
Reliability of the questionnaire was determined by pre-testing the questionnaire among populace of similar characteristics as the study sample with 30 respondents and the data obtained was analyzed using test statistics of Cronbach's reliability score with a score of 0.665.

### 2.2 Data Collection

Questionnaires were randomly administered among members of staff of the institution in the five schools which are schools of science, arts, languages, education and vocational and technical studies, members of staff in the registry were also administered the questionnaire for 3 weeks, with no fraction distribution across teaching and nonteaching staff.

The researcher recruited six research assistants, they were students from each of the schools mentioned above, and recruitment was done by the researcher from the 24 students nominated by the deans of each school using the simple random technique as they are more conversant with the members of staff. The six research assistants were trained on measurement and calculations of body mass index by converting measurement of height to meters and also using tape measurement for waist circumference correctly.
Blood pressure levels were taken by the researchers as most members of staff were not willing to be subjected to being measured by their students. The measurement was taken in the morning between 9am and 10am on all working days during the duration of data collection with an average of 15 respondents daily.
The questionnaire were administered to the respondents randomly and collected back upon taking the anthropometric measurements of waist circumference, body mass index and blood pressure levels.
A total number of 250 questionnaires were administered but 231 questionnaires were returned back to the researcher as some of the respondents did not give consent to the measurements and opted out of the study.

## 2.3 Data Analysis

The data collected were analyzed using Statistical Package for Social Science (SPSS) version 21. Frequency distribution was used in evaluating the demographic characteristics of respondents. Analysis of Variance (ANOVA), bivariate correlation, Regression, Independent Sample T-test and relevant descriptive statistics were used in analyzing the variables.

## 3. RESULTS AND DISCUSSION

The study consisted of 231 individuals (117 males and 99 females). The respondents were predominantly of Yoruba ethnicity (94.4%). A high proportion of the respondents (43.0%) were between the ages of 41 and 50 years and 200 (86.6%) respondents were married. Data collected revealed 148 (64.1%) academic members of staff and 68 (29.4%) non-academic members of staff. The study had 53 (45.3%) male respondents who were between the age of 41 and 50 years and 63 (63.6%) female respondents between the ages of 51 to 55 years. There were 18 (7.8%) unmarried respondents, who were of ages between 26 and 35 years with 9 (50%) between 26 and 30 years and 9 (50%) between 31 and 35 years; of the 200 (86.6%) married respondents, 86 (43%) were of ages 41 to 50 years. it was shown that 60 (40.5%) respondents who were academic members of staff between the ages of 41to 50 years and 32 (47.1%) non-academic members of staff respondents within 51 and 55 years of age. Result indicated 86 (37.2%) respondents between the ages of 41 and 50 years and 81 (35.1%) respondents between the ages of 51 and 55 years. (Table 2)
Visceral obesity was prevalent among 165 (71.4%) respondents with waist circumference higher than expected measurement (Fig. 1). An average percentage (53.0%) of male respondents with visceral obesity (WC > 94cm) when compared to the high percentage of 88.9% (WC > 80cm) in female respondents (Table 3). There was however a larger percentage of non-hypertensive individual with obese Waist circumference measurement than with individuals with normal WC circumference, 45.5% of the respondents were hypertensive (Fig 2).

**Table 2:** Socio-demographic characteristics of respondents

| | **GENDER** | | **MARITAL STATUS** | | **STAFF LEVEL** | | **ETHNIC** | **TOTAL** |
|---|---|---|---|---|---|---|---|---|
| | Male | Female | Single | Married | Academic | Non Academic | Yoruba | |
| | N (%) | N (%) | N (%) | N (%) | N (%) | N (%) | N (%) | **N (%)** |
| **AGE** | | | | | | | | |
| No respond | 13 (11.1) | 0 (0.0) | 0 (0.0) | 13 (6.5) | 13 (8.8) | 0 (0.0) | 13 (0.0) | **26 (11.3)** |
| 26 – 30 | 9 (7.7) | 0 (0.0) | **9 (50.0)** | 0 (0.0) | 9 (6.1) | 0 (0.0) | 9 (4.1) | **9 (3.9)** |
| 31 – 35 | 9 (7.7) | 5 (5.1) | **9 (50.0)** | 5 (2.5) | 9 (6.1) | 5 (7.4) | 14 (6.4) | **14 (6.1)** |
| 36 – 40 | 8 (6.8) | 0 (0.0) | 0 (0.0) | 8 (4.0) | 1 (0.7) | 7 (10.3) | 8 (3.7) | **8 (3.5)** |
| 41 – 50 | **53 (45.3)** | 31 (31.3) | 0 (0.0) | **86 (43.0)** | **60 (40.5)** | 24 (35.3) | **86 (39.4)** | **86 (37.2)** |
| 51 – 55 | 18 (15.4) | **63 (63.6)** | 0 (0.0) | 81 (40.5) | 49 (33.1) | **32 (47.1)** | 81 (37.2) | **81 (35.1)** |
| 56 – 60 | 6 (5.1) | 0 (0.0) | 0 (0.0) | 6 (3.0) | 6 (4.1) | 0 (0.0) | 6 (2.8) | **6 (2.6)** |
| 60 and above | 1 (0.9) | 0 (0.0) | 0 (0.0) | 1 (0.5) | 1 (0.7) | 0 (0.0) | 1 (0.5) | **1 (0.4)** |
| **TOTAL** | **117 (50.6)** | **99 (42.9)** | **18 (7.8)** | **200 (86.6)** | **148 (64.1)** | **68 (29.4)** | **218 (94.4)** | **231 (100)** |

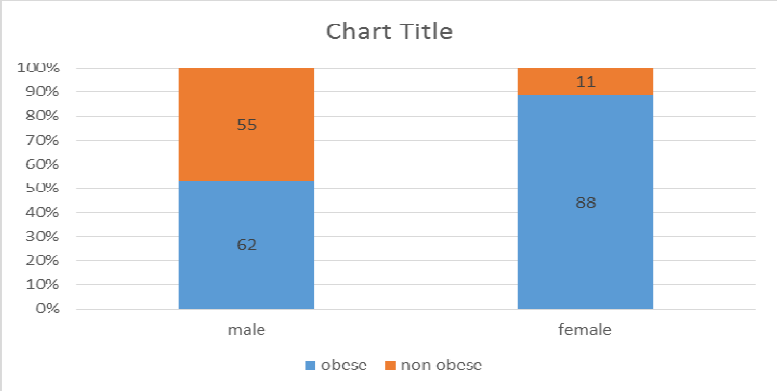


Fig. 1: Visceral obesity among respondents

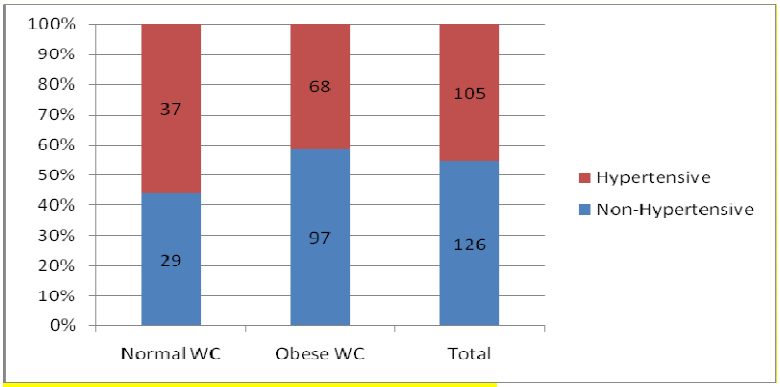


Fig. 2: Blood presure level of respondents

**Table 3:** Prevalence of visceral obesity among respondents

| | Gender | | | Total |
|---|---|---|---|---|
| | No Response | Male | Female | |
| **Non Obese** | 0 | 55 | 11 | 66 |
| | 0.0% | 83.3% | 16.7% | 100.0% |
| **Obese** | 15 | 62 | 88 | 165 |
| | 9.1% | 37.6% | 53.3% | 100.0% |
| **Total** | 15 | 117 | 99 | 231 |
| | 6.5% | 50.6% | 42.9% | 100.0% |

The study indicated the level of knowledge of participant at a score of 4.29 from a possible score of 9 (47.67%) with a very low level of knowledge at 1.27 score from a possible 4 (31.75%) on the causes of visceral obesity. Among the respondents, 71% of the respondents had below fifty percent of knowledge regarding visceral obesity followed by 17.7% who had average knowledge and only 11.3% had good knowledge about visceral obesity. (Table 4)

**Table 4:** The percentage distribution of knowledge of respondents

| LEVEL OF KNOWLEDGE | KNOWLEDGE SCORE | RANGE OF SCORE | F (%) |
|---|---|---|---|
| Good | 71 – 90% | 7 – 8 | 11.30% |
| Average | 50 – 70% | 5 – 6 | 17.70% |
| Below Average | Below 50% | 0 – 4 | 71.00% |
| **Minimum score = 0** | | **Maximum score = 9** | |

There was an evaluated high level of intake of salt, pastries (meat pie, doughnuts, burger, cake etc.) and animal protein (red meat, fried chicken and turkey), and also a low intake of fruits and vegetable in daily meals. (Table 5)

**Table 5:** Dietary intake of respondents

| | Level of consumption |
|---|---|
| **Consume Salt** | 84.00% |
| **Consume Pastries** | 81.25% |
| **Consume Animal Protein** | 82.00% |
| **Consume Soft Drinks** | 57.25% |
| **Consume Alcohol** | 37.75% |
| **Consume Fruits** | 9.75% |
| **Consume Vegetable** | 17.00% |

## 3.1 Discussion

Since abdominal obesity was significantly linked with cardiovascular diseases like type2 diabetes and hypertension [19, 34], it was necessary to compare relationship of waist circumference to BP and also relationship of BMI to BP. This was important to further establish the importance of visceral obesity in diagnosing cardiovascular diseases [8].

The results obtained from this study, which was similar to the findings of other studies [35-39] showed a more significant association of Waist Circumference with BP compared to association of BMI with BP. This indicated that there was a higher chance of developing hypertension with elevated waist circumference, than with high BMI.

There has been indication on the low level of knowledge of individuals on visceral obesity's relationship to hypertension [40, 41] and a wrong attitude towards visceral obesity, associating it with wealth and healthy living [31, 42], we also discovered this to be prevalent among participants in this study with emphasis on the causes of visceral obesity. This finding indicates a need for a more robust and comprehensive curriculum in creating awareness and education the Nigerian community on the importance of maintaining a more acceptable waist circumference to reduce prevalence and incidence rate of hypertension in the country.

There has been advocacy for the use of waist circumference in measurement of obesity [16, 18] but this has yet to gain root in the Nigerian health sector has waist circumference is still not in use in new and recent studies, we were able to determine that Waist Circumference is indeed a more accurate means of measuring obesity than BMI, has it showed a more significant association with hypertension than the later. Efforts needs to be made in advocacy, training and sensitization of health workers to enable a more accurate diagnosis of obesity.

Marital strain has been shown to have deleterious effects on cardiovascular functions and significantly associated with development of visceral obesity [24, 43] this was reflected in the findings of the study as unmarried respondents were without visceral obesity compared to a high percentage of married respondents being viscerally obese, this might be as a result of change in diet as prepared by significant other.

Also, several studies have established that prevalence of visceral obesity among the female gender [28, 34, 44] this was reflected in the findings of the present study, with a higher proportion of the female respondents having visceral obesity as compared to the proportion of male respondents, this however was contrary to the findings of [45] who found visceral obesity to be more prevalent among male respondents, however, this might be as a result of postpartum weight gain in women of child bearing ages and menopausal women [46-47] whom neck circumference may be more accurate in diagnosing obesity has it has shown significant relationship with waist circumference [48-49].

The present study indicated that there was a poor dietary pattern among respondents, with excessive consumption of salt, pastries, animal protein and a low intake of fruits and vegetables and significant relationship with development of visceral obesity was also established, this was similar to other studies [45, 50] who established a relationship between dietary pattern and development of visceral obesity.

Obesity has been a major public health problem in developing countries and there was no exception in the group of individuals in this study, high prevalence rate was recorded in this study, this has been attributed to the poor dietary patterns of the individuals and marital strain, however, health promotion intervention which will be directed towards reduction of the prevalence of visceral obesity may intervene and reduce the prevalence by a substantial percentage, this should not only be directed towards the obese individuals but towards their significant other (wives, husbands, children and other immediate family members). Also, for married men, it is important that their wives be sensitized on healthy diet

preparation, this is important because, in a traditional Nigerian home, the wives is responsible for choice of meal and is in charge of the preparation.
A major limitation of this study is that the study focused only on obesity as the only cause of hypertension, result may vary if other factors like stress level, physical activity and sedentary lifestyle and other co-morbid factors are considered. Nature of occupation has also been linked with hypertension [51] this was not put into consideration in the scope of the study, members of staff of the institution have different job description that may influence blood pressure level.
However, this study has identified the importance of individuals' significant others and immediate in influencing and encouraging intention and decision making in reduction of visceral obesity across gender.

## 4. CONCLUSION

This study has highlighted visceral obesity (using waist circumference) as an accurate anthropometric measurement for obesity, over BMI. This study has shown a more significant association of visceral obesity with high BP (hypertension) than BMI. This finding indicated that there was an increased likelihood of developing hypertension when an individual has elevated waist circumference (visceral obesity) compared to increased BMI. This finding is remarkable because it will improve health promotion, while creating awareness about visceral obesity and its association with high BP.

## CONSENT

Consent of respondents was sought before administering the questionnaire (instrument).

## ETHICAL APPROVAL

Ethical clearance was obtained from Babcock University Health Research Ethics Committee (BUHREC). Participants were informed of the purpose of the study and they were assured that confidentiality would be maintained. Their consent was sought for and granted, also participation was voluntary. They were informed of and their right to refuse to answer any of the questions or withdraw from the study at any point in this study. However, there was no reward or compensation for participating.

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## INFORMED CONSENT FORM

RELATIONSHIP BETWEEN VISCERAL OBESITY, BMI AND BP IN ILESA COMMUNITY, OSUN STATE, NIGERIA.

My name is Posi Aduroja, an MPh student in the Department of Public Health, Babcock University, Ilishan-Remo, Ogun state. The title of my research work as shown above is self-sponsored. The purpose of this study is to determine the prevalence of visceral obesity among members of staff of the Osun state college of education, Ilesa, Osun state. It is also suggest substantial recommendation of reducing visceral obesity, in order to prevent prevalence of cardiovascular diseases. The research

work which will remain in the domain of academic environment will serve the interest of students and the entire academic community and may be published in an academic journal.

The outcome of this research will help health officers, parents and lecturers in living a healthy live and implementing program that will encourage healthy society free of cardiovascular diseases.

The survey method will be used for data collection and analysis. Should you decide not to continue with the research, for any reason, be assured that you will not be penalized in any way. You are free to withdraw at any stage of the research if you so wish, as there is no conflict of interest whatsoever. You are however, assured that your response will be treated with utmost confidence and will be used only for academic purposes.

Please bear with me as there will be no reward or compensation for your participation in this research work. If you agree with these terms, please write your name and sign this consent form on the space provided below. Thank you.

_____ _____

Name, Signature & Date Witness Signature

***SECTION A*: *SOCIO-DEMOGRAPHIC CHARACTERISTICS***

***INSTRUCTION:*** *Please kindly tick [√] appropriately and supply adequate responses to the questions provided.*

1. Age group: 20-25 [ ] 26-30 [ ] 31-35 [ ] 36-40 [ ] 41-50 [ ] 51-55 [ ] 56-60 [ ] 60 and above [ ]
2. Gender: Male [ ] Female [ ]
3. Marital status: Single [ ] Married [ ] Divorced/Separated [ ]
4. Level of staff: Academic Staff [ ] Non-Academic Staff [ ]
5. Ethnic: Yoruba [ ] Igbo [ ] Hausa [ ] Others _____

***SECTION B*: *ANTHROPOMETRIC MEASUREMENTS (for official use only)***

6. Waist Circumference: _____ cm
7. BP: _____/_____ mmHg
8. Weight: _____kg Height: _____cm **BMI:** _____

***SECTION C: KNOWLEGDE OF VISCERAL OBESITY***

***INSTRUCTION:*** *Please kindly tick [√] appropriately and supply adequate responses to the questions provided.*

9. Visceral obesity is the accumulation of fat in the abdominal areas of the body.

   True [ ] False [ ]

10. The following are the causes of visceral obesity

    Excessive soft drink and alcohol consumption [ ]

    Mental disorder [ ]

Insufficient sleep / Stress [ ]

Lack of physical activities [ ]

11. Visceral obesity causes the following

High BP (hypertension) [ ]

Typhoid [ ]

Diabetes [ ]

Glaucoma [ ]

***SECTION D: ATTITUDE ON VISCERAL OBESITY***

***INSTRUCTION:*** *Please kindly tick [√] appropriately and supply adequate responses to the questions provided.*

**SA = STRONGLY AGREE A = AGREE NS = NOTSURE D = DISAGREE SD = STRONGLY DISAGREE**

| S/N | STATEMENT FOR CONSIDERATION | SA | A | NS | D | SD |
|---|---|---|---|---|---|---|
| 12 | Big tummy helps you to gain respect | | | | | |
| 13 | Big tummy gives you self-confidence in social gathering | | | | | |
| 14 | Big tummy is a sign of healthy living | | | | | |
| 15 | Big tummy increases individual's chances of cardiovascular disease | | | | | |
| 16 | Reducing big tummy takes longer time than gaining | | | | | |
| 17 | Exercising and eating healthy allows you reduce big tummy | | | | | |

***SECTION E: SUBJECTIVE NORM***

***INSTRUCTION:*** *Please kindly tick [√] appropriately and supply adequate responses to the questions provided.*

**SA = STRONGLY AGREE A = AGREE U – UNDECIDED D = DISAGREE SD = STRONGLY DISAGREE**

| S/N | STATEMENT FOR CONSIDERATION | SA | A | U | D | SD |
|---|---|---|---|---|---|---|
| 18 | My friends think I should reduce my big tummy | | | | | |
| 19 | I don't think it's necessary to reduce my big tummy | | | | | |
| 20 | My family members think I should engage in regular exercises | | | | | |
| 21 | Regular exercises is a waste of time | | | | | |
| 22 | TV programs suggest I should engage in healthy eating | | | | | |
| 23 | I don't believe in eating healthy | | | | | |
| 24 | My spouse think I should lose weight | | | | | |
| 25 | I don't think I need to lose weight | | | | | |

***SECTION F: PERCEIVED BEHAVIORAL CONTROL***

***INSTRUCTION:*** *Please kindly tick [√] appropriately and supply adequate responses to the questions provided.*

| S/N | STATEMENT FOR CONSIDERATION | YES | NO |
|---|---|---|---|
| 26 | I'm willing to start eating healthy but I don't know which food is healthy | | |
| 27 | Do you have enough discipline to maintain eating healthy? | | |
| 28 | I want to exercise regularly but I don't have enough time | | |
| 29 | If I know the benefits, I will be motivated to reduce my big tummy | | |
| 30 | Unavailability of gym in my neighborhood doesn't allow for regular exercises | | |
| 31 | I know big tummy is bad for my health but there is nothing I can do about it | | |

***SECTION G: BEHAVIORAL INTENTION***

***INSTRUCTION:*** *Please kindly tick [√] appropriately and supply adequate responses to the questions provided.*

| S/N | STATEMENT FOR CONSIDERATION | YES | NO |
|---|---|---|---|
| 32 | Will you engage in healthy eating subsequently? | | |
| 33 | Will you engage in regular exercise subsequently? | | |
| 34 | Will you stop consuming excessive animal protein? | | |
| 35 | Will you start taking more vegetables and fruits? | | |
| 36 | Will you stop taking excessive soft drinks and alcohol? | | |
| 37 | Are you willing to reduce your intake of salt? | | |
| 38 | Are you willing to reduce your consumption of pastries? | | |

***SECTION H: DIETARY PATTERN***

***INSTRUCTION:*** *Please kindly tick [√] appropriately and supply adequate responses to the questions provided.*

**N=NEVER NS=NOT SURE SP=SMALL PROPORTION MP=MEDIUM PROPORTION LP=LARGE PROPORTION**

| S/N | STATEMENT FOR CONSIDERATION | N | NS | SP | MP | LP |
|---|---|---|---|---|---|---|
| 39 | I use salt in cooking my food | | | | | |
| 40 | I consume pastries like meat pie, doughnuts, burger, cake etc. | | | | | |
| 41 | I consume animal protein like red meat, fried chicken and turkey. | | | | | |
| 42 | I take soft drinks daily | | | | | |
| 43 | I take alcohol daily | | | | | |
| 44 | I include fruits in my daily diet | | | | | |
| 45 | I include vegetables in my daily diet | | | | | |