Original Research Article

RELATIONSHIP BETWEEN VISCERAL OBESITY, BODY MASS INDEX AND BLOOD PRESSURE AMONG OSUN STATE COLLEGE OF EDUCATION STAFF, NIGERIA

ABSTRACT

Aims: To determine relationship between visceral obesity, body mass index (BMI) and blood pressure (BP) as predisposing risk factors to cardiovascular diseases.
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 (117 men and 99 women with the age range of 26-66 years). A semi-structured instrument (questionnaire) was used for data collection. Waist circumference was measured with a measuring tape. Body Mass Index was measured with a weighing scale and stadiometer. Blood pressure 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 blood pressure [R^2= 0.155; F = 20.989; P < .01] and also significantly associated with Body Mass Index [R^2= 0.044; F = 5.235; P = 0.006].
Conclusion: Visceral obesity was more significantly associated with high blood pressure than Body Mass Index; 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 body mass index

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 does not depend on body weight but rather on the location of the excess weight, this has now indicated that abdominal obesity (visceral obesity) is the form of obesity most likely to be associated with the CVD [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].
A study [9] revealed that there were 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 these fat serves 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 [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 blood pressure, elevated waist circumference, elevated triglycerides, reduced HDL cholesterol and elevated fasting glucose [11]. To have the metabolic syndrome, a person must have central adiposity defined on the basis of waist circumference and two or more of the other four criteria [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]. Visceral fat however accumulates with age and is greater in men than in women [16]. In determining waist circumference for visceral obesity, there is variability according to ethnicity and nationality; the IDF established a standard waist circumference according to ethnicity [17]. (Table 1)

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]. Body Mass Index (BMI) has been used in evaluating body weight and likelihood of developing CVD, it has been indicated that waist-hip circumference is a better measurement of body weight in association with CVD than BMI [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 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
South 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 blood pressure, 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 as in the pre-marital "fattening rooms" of

Nigeria [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 cardiovascular diseases and also to advocate for the use of waist circumference measurement in evaluating obesity.

This research will determine prevalence of visceral obesity and its association with blood pressure 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 the community and came to work in the institution. They were with an age range of between 20 and 70 years. This choice of age was chosen because it was established that visceral fat accumulated with age [16].

Random sampling method was used in selecting the participants for this study. Sample proportion was drawn using Cochran's formula [32]:

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

Sample size was calculated using formula adopted from Glenn [33]:

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

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 individual 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' Body Mass Index in unit value of kilogram per meter square (kg/m^2) with cutoff points of above $30kg/m^2$as obese and the sphygmomanometer was used in measuring the blood pressure of respondents with cutoff points at140 mmHg and 90 mmHg for systolic blood pressure (SBP) and diastolic blood pressure (DBP).

The questionnaire evaluated participants' demographic factors, knowledge of visceral obesity, attitude on visceral obesity, subjective norms on visceral obesity, perceived behavioral control on visceral obesity reduction, behavioral Intention and dietary pattern.

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 (appendix).

2.1 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), Correlation, Regression, Independent Sample T-test and relevant descriptive statistics was used in analyzing the variables.

3. RESULTS AND DISCUSSION

The respondents were predominantly of Yoruba ethnicity (94.4%) with 117 (50.6%) males and 99 (42.9%) females. A high proportion of the respondents 86 (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 respondents with 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) while compared to the high percentage of 88.9% (WC > 80cm) in female respondents (Table 3).

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)**

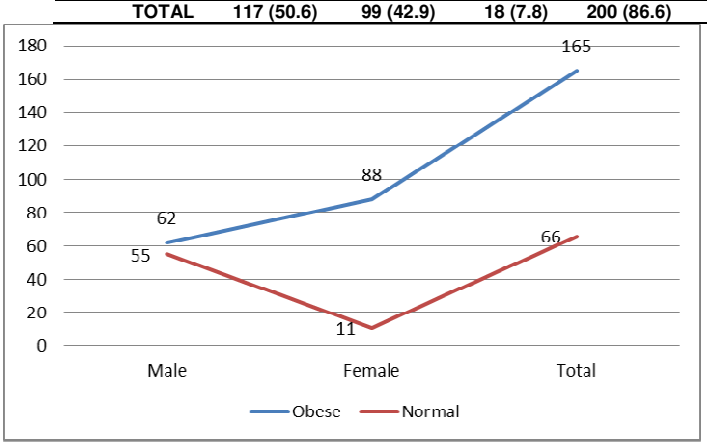

Fig. 1: Visceral obesity among respondents

Table 3: Prevalence of visceral obesity among respondents

	Gender			Total
	No Response	Male	Female	
Normal	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 level of knowledge of respondents on visceral obesity was below fifty percent (47.67%) with a low level of knowledge (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

	Mean		Std. Deviation	Variance
	Statistic	**Std. Error**	**Statistic**	**Statistic**
Consume Salt	*0.64	0.057	0.868	0.753
Consume Pastries	*0.75	0.071	1.085	1.178
Consume Animal Protein	*0.72	0.064	0.965	0.932
Consume Soft Drinks	*1.71	0.084	1.271	1.616
Consume Alcohol	*2.49	0.060	0.918	0.842
Consume Fruits	0.39	0.050	0.765	0.586
Consume Vegetable	0.68	0.060	0.918	0.843

**low percentage represents high intake and high percentage represents low intake level*

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 blood pressure and also relationship of Body Mass Index (BMI) to blood pressure. 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 Blood Pressure compared to association of Body Mass Index with Blood Pressure. This indicated that there was a higher chance of developing hypertension with elevated waist circumference, than with high body mass index.

The results of this study indicated that visceral obesity was prevalent among the community studied. Marital strain has been shown to have deleterious effects on cardiovascular functions and significantly associated with development of visceral obesity [24, 40] 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.

Also, several studies have established that prevalence of visceral obesity among the female gender [28, 34, 41] 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 [42] who found visceral obesity to be more prevalent among male respondents.

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 [42-43] who established a relationship between dietary pattern and development of visceral obesity.

4. CONCLUSION

Visceral obesity plays a central role in the diagnosis of MetS, which evaluates an individual's susceptibility to cardiovascular diseases; this is measured with waist circumference with standard cutoff mark indicating its presence. This has highlighted waist circumference (WC) as an accurate anthropometric measurement for obesity, over Body Mass Index (BMI). This study has shown a more significant association of WC with high blood pressure (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 body mass. This finding is remarkable because it will improve health promotion, while creating awareness about visceral obesity and its association with high blood pressure.

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 and 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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DEFINITIONS, ACRONYMS, ABBREVIATIONS

ANOVA: Analysis of Variance
BMI: Body Mass Index
BUHREC: Babcock University Health Research Ethics Committee
CVD: Cardiovascular Disease
DBP: Diastolic Blood Pressure
HDL: High Density Lipoprotein
IDF: International Diabetes Federation
MetS: Metabolic Syndrome
NAFLD: Non-Alcoholic Fatty Liver Disease
NCD: Non-Communicable Disease
NCEP: National Centers for Environmental Prediction
OSSCOED: Osun State College of Education
SBP: Systolic Blood Pressure
SPSS: Statistical Package for Social Science
WC: Waist Circumference
WHO: World Health Organization

APPENDIX

Appendix 1: **Regression analysis of association**

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.436[a]	.190	.165	.414

a. Predictors: (Constant), TAKE VEGETABLE, EAT SALT, TAKE ALCOHOL, TAKE FRUITS, EAT PASTRIES, TAKLE SOFT DRINKS, EAT ANIMAL PROTEIN

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	8.954	7	1.279	7.470	.000[b]
	Residual	38.188	223	.171		
	Total	47.143	230			

a. Dependent Variable: WAIST GROUP

b. Predictors: (Constant), TAKE VEGETABLE, EAT SALT, TAKE ALCOHOL, TAKE FRUITS, EAT PASTRIES, TAKLE SOFT DRINKS, EAT ANIMAL PROTEIN

Appendix 2 **showing Regression analysis of significant association**

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.408[a]	.166	.163	1.09557

a. Predictors: (Constant), OVERALL NORM ON A 24-POINT RATING SCALE

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	54.858	1	54.858	45.704	.000[b]
	Residual	274.865	229	1.200		
	Total	329.723	230			

a. Dependent Variable: OVERALL INTENTION ON A 7-POINT RATING SCALE

b. Predictors: (Constant), OVERALL SUBJECTIVE NORM ON A 24-POINT RATING SCALE

Appendix 3 **showing Regression analysis of significant association**

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.394[a]	.155	.148	11.248

a. Predictors: (Constant), DIASTOLIC BLOOD PRESSURE, SYSTOLIC BLOOD PRESSURE

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5310.758	2	2655.379	20.989	.000[b]
	Residual	28845.225	228	126.514		
	Total	34155.983	230			

a. Dependent Variable: WAIST CIRCUMFERENCE

b. Predictors: (Constant), DIASTOLIC BLOOD PRESSURE, SYSTOLIC BLOOD PRESSURE

Appendix 4 **showing Regression analysis of significant association**

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.210[a]	.044	.036	3.5441

a. Predictors: (Constant), DIASTOLIC BLOOD PRESSURE, SYSTOLIC BLOOD PRESSURE

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	131.498	2	65.749	5.235	.006[b]
	Residual	2863.786	228	12.560		
	Total	2995.285	230			

a. Dependent Variable: BMI

b. Predictors: (Constant), DIASTOLIC BLOOD PRESSURE, SYSTOLIC BLOOD PRESSURE

INFORMED CONSENT FORM

RELATIONSHIP BETWEEN VISCERAL OBESITY, BODY MASS INDEX AND BLOOD PRESSURE 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. Blood Pressure: _____/_____ 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 Blood Pressure (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					