OBESITY, PHYSICAL ACTIVITY PATTERN AND HYPERCHOLESTEROLEMIA AMONG CIVIL SERVANTS IN BIDA NIGER STATE NIGERIA

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ABSTRACT

Background: Lack of empirical data on the prevalence of overweight/obesity and hypercholesterolemia as well as their complications is of concern in developing countries like Nigeria. Thus, there is need for regular surveillance on the prevalence of these conditions to enable implementation of effective control strategies.

Objectives: The study assessed the prevalence of overweight/obesity, hypercholetrolemia and physical activity pattern among civil servants in Bida Local Goverment Area of Niger state Nigeria.

Methodology: Structured and validated questionnaire was used to obtain information on demographic and physical activity/exercise pattern from 402 subjects' sampled using stratified random sampling by ballot without replacement in the study. Anthropometric data was measured with appropriate tool for each measurement. Total cholesterol was analysed using Randox Kit. Data was compared with standards and analyzed. Data was described with mean, standard deviation, frequency and percentage. Analysis was done with Chi square and Pearson coloration. Results were presented in tables and figures.

Result: Result revealed that 31.3% were overweight and 53.2% were obese, only 13.86% had normal percentage body fat, 41.79% of the respondents had a normal visceral fat level (≤9), 35.82% of the respondents had an increased health risk using waist circumference classification and 57.21% had an increased health risk when waist – hip ratio classification was used. Blood cholesterol result also showed that 74.4% were within normal range. This study showed that there is a positive correlation between serum cholesterol and BMI, %body fat, % skeletal muscle, visceral fat, waist circumference and hip circumference at P-value < 0.001.

Conclusion: There is epidemic of overweight/obesity and raised blood cholesterol among civil servants in Bida area.

Keywords: ***obesity, overweight, hypercholesterolemia, visceral fat, civil servants***

INTRODUCTION

Obesity, high visceral fat accumulation, high percentage body fat, and hypercholesterolemia are important risk factors associated with cardiovascular diseases in both developed and developing countries [1]. Obesity is associated with excess fat accumulation in the body [2, 3]. Obesity is defined as a condition where an individual has accumulated excessive body fat that has the potentialto initiate a negative effect on health and nutritional status [4]. If anindividual's bodyweight is at least 20% higher than it should be, he or she is considered obese [5]. The abdominal adiposity consists of visceral fat contained within the abdomen and body cavity [6, 5, 4]. Hypercholesterolemia refers to a clinical condition resulting in raised cholesterol levels in the blood [7].

The predisposing factors to obesity and hypercholesterolemiain clude excess food and energy consumption without a corresponding output to use the intake, hence, resulting to a positive energy balance. Another risk factor for obesity and hypercholesterolemia is lifestyle that encourages sendary living, excess and frequent consumption of soft drinks and high energyy and fatty foods. Genetic predisposition is also a very important risk factor for obesity and hypercholesterolemia [5]. Obesity is a major risk factor for almost all the non-communicable chronic disease (NCD) and also causes disease complications and difficulty in managing diseases [8].

The World Health Organization report for Nigeria stated that the probability of dying between ages 30 and 70 years from the 4 main from non-

communicable chronic diseases (NCDs) – cardiovascular diseases (CVDs), diabetes, cancer and chronic respiratory diseases in Nigeria is 20% [9].The increase in calorie intake, overweight and obesity with sedentary lifestyle contribute to the development of non-communicable chronic diseases such as cancer, diabetes, hypertension, cardiovascular diseases among others. The prevention of these diseases through lifestyle interventions has been studied more because the prevalence of diabetes is greater than ever [10].

The civil servants are employees of Nigerian government agencies other than the military, majority of them are known for sedentary work [11]. Experience in providing nutrition intervention services to civil servants have shown that majority of civil servants spend more time in the office doing sedentary work and are very busy to cook instead they eat outside their homes, thus they are predisposed toconsumption of whatever that is available sold by food vendors, fast food centers or retaurants in the work place which may lead to eating inadequate diet high in fat and energy but low in micronutrients. Commercial eating centres are more concerned with profits other than the health of their customers. Thus, consequences of poor diet and lack of exercise can lead to obesity,hypercholesterolemia, hypertension, diabetes and joint problem.

The objective of this study was to determine the prevalence of overweight, obesity and hypercholesterolemia among civil servants in Bida local government area using anthropometric parameters such as weight, height, waist circumference, waist-hip ratio, viceral fat, total body fat, muscle mass and blood cholesterol test respectively.The physical activity and exercise pattern of the respondents were also determined and correclated with cholesterol level. This study is significant because it will serve as a baseline study for the chosen population in Bida.The study will as well be of value to agencies involved in implementing programs aimed at improving the health and nutritional status of civil servants in the community.

METHODOLOGY

Study Design

The studywas a cross-sectional study among civil servants working in Bida Local Government Area in Niger state with the use of structured questionnaire on formal interview basis as well as direct physical measurements.

Study Area

The study area is Bida Local Government Area of Niger State, Nigeria. Bida is the traditional head-quarters of Nupe Kingdom. The Nupes live in the low basin formed by the two valleys of Rivers Niger and Kaduna. They are basically farmers and pre-dominantly Moslems. The town is said to have been a base for hunters, therefore, it was safe from marauders. The name Bida was derived from two attributes of the town. To the Binis-Bida means" come let's go for safety and comfort', while to the Gwaris-Bida means "beauty of meat is there" [12].

Since the late 1950s, Bida town has enjoyed a number of social amenities. There are now in the town several educational and social institutions such as a federal polytechnic, a federal medical centre, the National Cereal Research Institute, Niger State School of Nursing and Midwifery, and numerous Koranic, primary and post-primary institutions. The existence of these institutions has led to an influx of diverse ethnic groups from other states of the federation most especially from the western part of the country [12]

Study Population

The National Population Commission 2006 Population Census Result reported that Bida has a total population of 188,181 comprising of 95,561 males and 92,620 females. However, the population of state civil servants in Niger is recorded to be 35,843 in department of Budget and Planning, Ministry of Education, Ministry of Health, Fire Service & Board of Internal Revenue [12]. However, according to information gathered from Bida Local government secretariat the total number of civil in Bida local government area is 4937.

This cross-sectional study was conducted on state and federal government workers in Bida emirate. Civil servants within the ages of 18 - 60 years were requested to participate in the study. Pregnant and lactating women were excluded from the study as most of the anthropometric measurement was not appropriate for them.

Sample Size Determination

The test of significance used was 0.05 (i.e. 5%). To determine the sample size, this formula will be used:

$$n = \frac{N}{1 + N(e^2)}$$

Where: n = Sample Size
N = Population Size
1 = Constant
e = Margin of error test of significance $(0.05)^2$

$$= \frac{4937}{1 + 4937(0.05)^2}$$

$$= \frac{4937}{1 + 12.3425}$$

$$= \frac{4937}{13.3425} = 370 \text{ samples,}$$

However, 10% of the sample size was added to make room for error of estimation. = 10% of 37 = 37, therefore the sample size will be 370+37 = 407 samples.

Sampling techniques

A systematic simple random technique was adopted to obtain the target respondents for the study. A total of 402 respondents consented to participate in the study however only 39 respondents consented for their blood to be tested for cholesterol level. The participants were enrolled from randomly selected sectors and sub-sectors within Bida local government area. These sectors include ministry of education (primary schools, secondary schools, and tertiary institutions), health sector, communication, agriculture and water resources, land, traditional council and rural development.

Data Collection Techniques and Tools

Height and weight were measured with the subjects at standing position. The height of all participants was measured using a stadiometer and weight was measured using a Full Body Sensor Body Composition Monitor and Scale (Omron model HBF-516, Omron Healthcare, USA). The Omron Full Body Sensor Body Composition Monitor and Scale estimates the Body Mass Index (BMI), body fat percentage (% body fat), skeletal muscle percentage (% muscle mass), and visceral fat by the bioelectrical impedance method [13]. Throughout the study all body measurements were made according to standard protocols and cut-offs proposed by the World Health Organization (WHO) [1].

Data was collected using validated questionnaire to capture information related to socio-demographic characteristics. The tables below were used as the reference table for all the measurement for anthropometric measurement carried out with the BIA.

Table 1:The International Classification of Adult BMI

	Classification	**Principal Cut-Off Point (BMI – kg/m^2)**
1.	Underweight	<18.50
2.	Normal Range	18.50 – 24.99
3.	Overweight	25.00 – 29.99
4.	Obese	≥30.00

Source: [1]

Table 2: Reference range of Body Fat Percentage (% body fat)

Gender	**Age**	**Low**	**Normal**	**High**	**Very High**
	20 – 39	< 21.0	21.0 – 32.9	33.0 – 38.9	≥ 39.0
Female	40 – 59	< 23.0	23.0 – 33.9	34.0 – 39.9	≥ 40.0
	60 – 78	< 24.0	24.0 – 35.9	36.0 – 41.9	≥ 42.0
	20 – 39	< 8.0	8.0 – 19.9	20.0 – 24.9	≥ 25.0
Male	40 – 59	< 11.0	11.0 – 21.9	22.0 – 27.9	≥ 28.0
	60 – 79	< 13.0	13.0 – 24.9	25.0 – 29.9	≥ 30.0

Source: [13]

Table 3: Reference range of Skeletal Muscle Percentage (% muscle mass)

Gender	**Age**	**Low**	**Normal**	**High**	**Very High**
	20 – 39	< 24.3	24.3 – 30.3	30.4 – 35.3	≥ 35.4
Female	40 – 59	< 24.1	24.1 – 30.1	30.2 – 35.1	≥ 35.2
	60 – 78	< 23.9	23.9 – 29.9	30.0 – 34.9	≥ 35.0
	20 – 39	< 33.3	33.3 – 39.3	39.4 – 44.0	≥ 44.1
Male	40 – 59	< 33.1	33.1 – 39.1	39.2 – 43.8	≥ 43.9
	60 – 79	< 32.9	32.9 – 38.9	39.0 – 43.6	≥ 43.7

Source: [13].

Table 4: Reference range of Visceral Fat Level

Visceral Fat level	Visceral Fat Level Classification
≤ 9	Normal
10 – 14	High
≥ 15	Very High

Source: [13].

Total Cholesterol measurement

Blood samples were obtained from the subjects after 9 – 12 hours overnight fast by a laboratory technician. The blood samples were well-labelled in sample bottles from the sub-sample population. The sample bottles were transported back to the laboratory in iceboxes within two hours of collection (at a temperature of -20^{0}C). The total cholesterol of the subjects was analysed using Randox Kit. The blood total cholesterol levels of the subjects were classified according to table 5 below.

Table 5: Classification of Total Cholesterol Level

Total cholesterol Ranges	Definition
<200 mg/dl (5.17 mmol/l)	Desirable
200 – 239 mg/dl (5.1 – 6.18 mmol/l)	Borderline high
≥240 mg/dl (≥6.1 mmol/l)	High

Source: [14]

Data and Statistical Analysis

Data was collected and edited to exclude errors, re-organized, coded and manipulated for efficient analysis. Data was analyzed with computerized software which include SPSS Version 20 and Microsoft excel 2013. Data was analysed for frequency of distribution, proportion and percentages for qualitative variables, mean ± SD, correlations for quantitative variables. Results were calculated based on 95% and 99% Confidence Interval (α=0.005 and α=0.001) and tested using Pearson Chi – Square test. Results were presented in tables and figures.

Ethical Approval

Ethical clearance was given by Federal Medical Centre Bida. Participants was informed about the content of the interviews to enable them understand the procedures and give their full approval. The importance of the study was made known to the participants as well as any possible risk that may be involved. Participation was made voluntarily, thus, individuals were given the right to or not to take part in the study. Only consenting individuals were chosen to be interviewed and other measurements taken.

RESULTS

Table 6: Age, Gender and Religious Distribution of the Respondents

Parameter	Frequency	Percent
Age (years)		
20-29	106	26.4
30-39	139	34.6
40-49	124	30.8
50-59	32	8.0
60-69	1	0.2
Total	402	100.0
Gender		
Female	178	44.3
Male	224	55.7
Total	402	100.0
Religion		
Christianity	201	50.0
Islam	201	50.0
Total	402	100.0

Table 6 showed that majority of the respondents were between ages 30 -39 years of age, only one (1) person was due for retirement which is 60 – 09 years. Also in the table, 55,7% were males while 44.3% were females. Their religious affiliation showed that 50% were Muslims and 50% were Christians

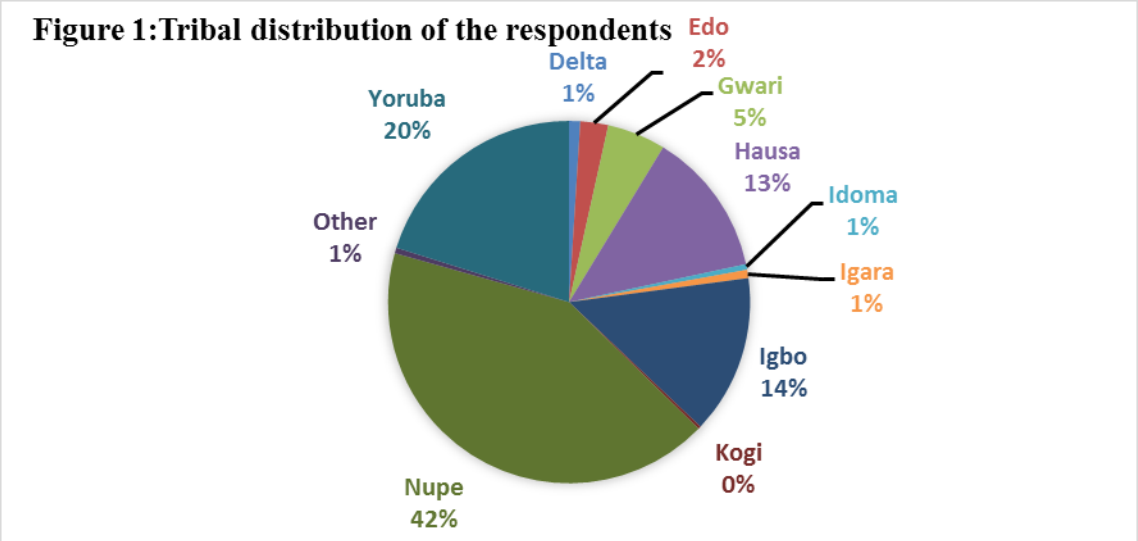

Figure 1 showed that majority of the respondents were from Nupe (42%) tribe, those from Igbo, Yoruba, and Hausa tribes were 14%, 20% and 13% respectively.

Table 7: Distribution of Educational Level attained, Source of Water and Toilet Facilities of the Respondents

Parameter	Frequency	Percentages
Educational level		
Masters	2	0.5
Primary	17	4.2
Secondary	39	9.7
Tertiary	344	85.6
Total	402	100.0
Water Source		
Borehole	318	79.1
Buy Water	14	3.5
Pipe Borne Water	45	11.2
River/Stream	10	2.5
Well	15	3.7
Total	402	100.0
Toilet Facility		
Bucket	8	2.0
Pit latrine	52	12.9
Water system	342	85.1
Total	402	100.0

Table 7 showed that 86.1% of the respondents had tertiary education, 9.7% had secondary education and only 4.2% had primary education. Also the table revealed that 79.1% had access to borehole water, 2.5% had river/stream as their source of water supply, 3.5% buy their water, 3.7% source their water from well and only 11.2% source their water from pipe borne water. Table 4.2 as well showed that 85.1% had water system as their toilet facility, 12.9% uses pit latrine and only 2% uses bucket for toileting.

Table 8a: Prevalence of overweight and obesity

Body Mass Index (kg/m^2)	Frequency	Percentages (%)	Classification
18.5-24.9	62	15.4	**Normal**
25.0-29.9	126	31.3	**Overweight**
>30	214	53.2	**Obese**
Total	**402**	**100.0**	

Table 8a showed that only 15.4% had normal weight, 31.3% were overweight and 53.2% were obese.

Table 8b: Prevalence of overweight and obesity by gender

Body Mass Index (kg/m^2)	Female F (%)	Male F (%)	Classification
18.5-24.9	18 (10.1)	44 (19.6)	**Normal**
25.0-29.9	49 (27.5)	77 (34.4)	**Overweight**
>30	111(62.4)	103 (46.0)	**Obese**
Total	**402**	**100.0**	

Table 8b showed that 10.1% of females had normal weight, 27.5%% were overweight and 62.4% were obese. While among the males, that 19.6% had normal weight, 34.4% were overweight and 46% were obese.

Table 8c: Prevalence of overweight and obesity by age group

Age (years)	Normal (F) %	Overweight (F) %	Obese (F)	Total (F)
20-29	24.00(5.97)	44.00 (10.95)	38.00 (9.45)	106.00 (26.37)
30-39	20.00(4.98)	40.00 (9.95)	79.00 (19.65)	139.00 (34.58)
40-49	12.00(2.99)	33.00 (8.21)	79.00 (19.65)	124.00 (30.85)
50-59	5.00(1.24)	9.00 (2.24)	18.00 (4.48)	32.00 (7.96)
60-69	1.00 (0.25)	0.00 (0.00)	0.00 (0.00)	1.00 (0.25)
Total	**62.00 (15.42)**	**126.00 (31.34)**	**214.00 (53.23)**	**402.00 (100.00)**

Key:
Normal = BMI: 18.50 – 24.9kg/m^2
Overweight = BMI: 25 – 29.90 kg/m^2
Obese = BMI: > 30 kg/m^2

Table 8c showed that the prevalence of overweight was highest among respondents aged 20 – 30 years (10.95%) and obesity was highest among age group 30 – 39 and 40 – 49 years which had 19.65% for each group respectively.

Table 9: Anthropometric characteristics of the respondents

Parameter	Mean	Standard Deviation
Height (cm)	155.6	13.71
Weight (kg)	75.93	15.48
Body Mass Index (BMI) (kg/m$^{2)}$	31.35	6.52
Visceral Fat level	11.45	4.84
% Body Fat	37.89	11.42
% Skeletal Muscle	28.59	6.95
Waist Circumference (cm)	93.31	13.84
Waist – Hip Ratio	0.90	0.10

Table 9 showed the anthropometric characteristics of the respondents. The table showed that the mean BMI of the respondents was in the obesity class >30 kg/m^2 (31.35 kg/m^2). The mean visceral fat was 11.45 which is classified as high (>9).

Table 10a: Anthropometric health risk markers measured in BIA machine

Parameter	Low	Normal	High	Very High	Total
	F (%)	F (%)	F (%)	F (%)	F (%)
FEMALES					
Body Fat (%)	0 (0.00)	18 (10.11)	20 (11.24)	140 (78.65)	178 (100.00)
MALES					
Body Fat (%)	0 (0.00)	37 (16.52)	45 (20.09)	142 (63.39)	224 (100.00)
Total	**0 (0.00)**	**55 (13.68)**	**65 (16.17)**	**282 (70.15)**	**402 (100.00)**
FEMALES					
Skeletal Muscle (%)	133 (74.72)	40 (22.47)	5 (2.81)	0 (0.00)	178 (100.00)
MALES					
Skeletal Muscle (%)	110 (49.11)	78 (34.82)	31 (13.84)	5 (2.23)	224 (100.00)
Total	**243 (60.45)**	**118 (29.35)**	**36 (8.96)**	**5 (1.24)**	**402 (100.00)**

Table 10a showed that 70.15% of the respondents had very high percentage body fat, 16.17% had high percentage body fat, and only 13.86% had normal percentage body fat.

Table 10b: Anthropometric health risk marker (visceral fat) measured with BIA machine

Parameter	Normal	High	Very High	Total
	F (%)	F (%)	F (%)	F (%)
Visceral fat	168 (41.79)	140 (34.83)	94 (23.38)	402 (100.00)

Table 10b showed that only 41.79% of the respondents had a normal visceral fat level (≤9), 34.83% had high visceral fat level (10 – 14) and 23.38% had very high visceral fat level (≥15).

Table 10c: Anthropometric health risk markers

Parameter	Normal	High Risk	Total
	F (%)	F (%)	F (%)
FEMALES			
Waist Circumference	72 (40.45)	106 (59.55)	178 (100.00)
MALE			
Waist Circumference	186 (83.04)	38 (16.96)	224 (100)
Total	**258 (64.18)**	**144 (35.82)**	**402 (100)**
FEMALES			
Waist – Hip Ratio (WHR)	56 (31.46)	122 (68.54)	178 (100.00)
MALE			
Waist – Hip Ratio (WHR)	116 (51.79)	108 (48.21)	224 (100.00)
Total	**172 (42.79)**	**230 (57.21)**	**402 (100.00)**

Table 10c showed that 35.82% of the respondents have an increased health risk using waist circumference classification. Also 57.21% of the respondents have an increased health risk when waist – hip ratio classification was used.

Table 10d: Correlation between age and BMI level of the respondents

Count

Age group (years)	AGE (Years) vs BMI (Kg/m2)				Pearson Chi-Square		
	18.5-24.9	25.0-29.9	>30	Total	Value	df	P-value
20-29	24	44	38	106	**25.562[a]**	8	**0.001**
30-39	20	40	79	139			
40-49	12	33	79	124			
50-59	5	9	18	32			
60-69	1	0	0	1			
Total	62	126	214	402			

P-value ≤ 0.001 is considered significant

Table 10d showed the correlation between age and BMI levels of the respondents using Pearson Chi – Square test. This table showed that there is a statistical significant difference between BMI level and age of the respondents at P-value ≤ 0.001.

Table 11a: Prevalence of raised cholesterol

Cholesterol Level (mmol/l)	Frequency	Percent
<5.17 (desirable)	29	74.4
5.17-6.18 (borderline)	5	12.8
>6.18 (high)	5	12.8
Total	**39**	**100.0**

Table 11ashowed that 12.8% of the respondents had raised cholesterol. 12.8% were in the borderline and 74.4% were within normal range

Table 11b: Spearman's correlation between cholesterol and anthropometric characteristics of the respondents

		BMI	% Body Fat	% Skeletal Muscle	Visceral fat	WC	HC	WHR
Cholesterol	r	0.840	0.700	-0.602	0.655	0.664	0.516	0.289
	p	0.000*	0.000*	0.000*	0.000*	0.000*	0.001*	0.075

P-value ≤ 0.001 is considered significant
WC = Waist Circumference
HC = Hip Circumference
WHR = Waist – Hip Ratio
BMI = Body Mass Index

Table 11b showed the correlation between cholesterol and BMI, cholesterol and % body fat, cholesterol and % skeletal muscle, cholesterol and visceral fat, cholesterol and WC, cholesterol and HC and cholesterol and WHR respectively using Spearman's correlation. This table showed that there is a positive correlation between cholesterol and BMI, %body fat, % skeletal muscle, visceral fat, waist circumference and hip circumference. However, there is no statistical difference between serum cholesterol level and WHR at P-value > 0.001

Table 11c: Correlation between age and cholesterol level of the respondents
Count

Age group (years)	Cholesterol Level (mmol/l)				Pearson Chi-Square		
	<5.17	5.17-6.18	>6.18	Total	Value	df	P-value
20-29	4	0	0	4	10.082[a]	8	0.259
30-39	6	4	1	11			
40-49	13	1	2	16			
50-59	5	0	2	7			
60-69	1	0	0	1			
Total	29	5	5	39			

P-value ≤ 0.005 is considered significant
Table 11c showed the correlation between age and cholesterol levels of the respondents using Pearson Chi – Square test. This table showed that there is no statistical significant difference between age and cholesterol levels of the respondents at P-value > 0.005

Table 11d: Correlation between gender and cholesterol level of the respondents
Count

	Cholesterol Level (mmol/l)				Pearson Chi-Square		
Gender	<5.17	5.17-6.18	>6.18	Total	Value	df	P-value
Male	17	1	3	21	2.647[a]	2	0.266
Female	12	4	2	18			
Total	29	5	5	39			

P-value ≤ 0.005 is considered significant

Table 11d revealed the correlation between gender and cholesterol levels of the respondents using Pearson Chi – Square test. This table showed that there is no statistical significant difference between male and female in their respective cholesterol levels at P-value > 0.005

Table 12a: Physical activity pattern

Activity Description	Frequency	Percent
Administrative	144	35.8
Bench work	14	3.5
Café attendant	1	0.2
Cleaner	10	2.5
Cleaning	4	1.0
Clerical	3	0.7
Cooking	6	1.5
Customer care	2	0.5
Dentist	2	0.5
Lab work	15	3.7
Legal practitioner	1	0.2
Nursing	36	9.0
Police	1	0.2
Secretary	1	0.2
Security	4	1.0
Tailoring	2	0.5
Tailoring	1	0.2
Teaching	143	35.6
Nil	16	4.0
Total	**402**	**100.0**

Table 12a showed the physical activity pattern of the respondents. Majority of them 35.8% do more of administrative work and only 4% do nothing actually.

Table 12b: Exercise participation of the respondents

Response to practice of exercise	Frequency	Percent
No	81	20.1
Yes	321	79.9
Total	**402**	**100.0**

Table 12b showed that 79.9 % of the respondents engages in exercise and only 20.1 percent do not at all.

Table 12c: Specific exercises/activities respondents participates actively

Type of Exercise	Frequency	Percent
Brisk walking	133	33.1
Cycling	7	1.7
Driving	1	0.2
Farm work	4	1.0
Football	32	8.0
Indoor/exercises	2	0.5
Jogging	162	40.3
Long jump	3	0.7
Press up	2	0.5
Seat up	12	3.0
Skipping	2	0.5
Trekking	6	1.5
Volleyball	1	0.2
Brisk walking	22	5.5
Nil	13	3.2
Total	**402**	**100.0**

Table 12c reveal that majority 40.3% did more of jogging and 33.1 more of brisk walk as the type of exercise/activity they do more often. Playing volleyball and driving vehicle (0.2% each) were least done by the people.

Table 12d: Purpose of exercise

Purpose	Frequency	Percent
body building	1	0.2
Hobby	29	7.2
keep fit	263	65.4
weight loss	109	27.1
Total	**402**	**100.0**

Table 12d showed that only 0.2% of the respondents did exercise for the purpose of body building, 65.4% participated in exercise to keep fit while 27.1% desired to reduce their weight and only 7.2% took it as a hobby.

Table 12e: Correlation between exercise and cholesterol level of the respondents

Count

	Cholesterol Level (mmol/l)				Pearson Chi-Square		
Exercise	**<5.17**	**5.17-6.18**	**>6.18**	**Total**	**Value**	**df**	**P-value**
Yes	24	5	4	33	1.068[a]	2	0.586
No	5	0	1	6			
Total	29	5	5	39			

P-value ≤ 0.005 is considered significant

Table 12e showed the correlation between exercise and cholesterol level using Pearson Chi – Square test. This table showed that there is no statistical significant difference between exercise and serum cholesterol level at P-value > 0.005

DISCUSSION

Anthropometry refers to the measurement of body size, weight, and proportions and body composition refers to the distribution of body compartments (muscle mass and body fat) as part of the total body weight [15]. The evaluation both anthropometric and body composition data allows the clinician to fully assess these compartments [5, 15]. This study determined the prevalence of overweight and obesity among civil servants in Bida. Body mass index (BMI) was used as a parameter for assessment. It was found that 15.4% of the respondents had normal weight, 31.3% were overweight and 53.2% were obese. Obesity experts have long stated that the epidemic of obesity is a public health crisis. It is causing a great burden of morbidity and mortality culminating in enormous economic, social and human costs [16].

In a similar study it was found that in a "cross-sectional study among a random sample of 1058 adults, who were visitors and staff of a government worksite in Abuja, an urban city in Nigeria, the overall prevalence of overweight or obesity (body-mass index $\geq$ 25 kg/m^2) was 64% (74% of the women and 57% of the men)" [17]. This is lower than the present study as the overall prevalence of overweight or obesity (body-mass index $\geq$ 25 kg/m^2) in this study was 84.5% (89.9% of the women and 80.4% of the men). Also in another study on the prevalence overweight and obesity among the Kalabari ethnic group in the Niger Delta region of Nigeria, it was found that the prevalence of overweight and obesity were also high as 22.04% were overweight, and 49.34 % were obese as the overall prevalence in that area was 71.38% of prevalence of overweight and obesity [18]. It is established that obesity and overweight poses a major risk for many chronic diseases, including type 2 diabetes, cardiovascular disease, hypertension, stroke, erosive oesophagitis, fatty liver and certain forms of cancer. The prevalence of obesity and overweight has reached pandemic proportions and is rapidly increasing in both industrialized and developing nations [5, 19, 20, 1]. The World Health Organization reported that obesity has reached epidemic proportions globally, with more than 1 billion adults overweight and at least 300 million of them clinically obese [1].

Obesity among women was higher in this study and in other studies by other researchers in Nigeria. This could be attributed to the social norms and gender roles in our societies where women are seen mainly as home maker confined to their homes due to their pressing household chores with little or no chance for recreational or sporting activities [21].

This study also revealed that 35.82% of the respondents have an increased health risk using waist circumference classification. Also 57.21% of the respondents has an increased health risk when waist – hip ratio classification was used. Body Mass Index is regarded as a gold standard for defining overweight and obesity [21]. BMI is an indicator of overall adiposity while Waist Circumference (WC) and Waist-to-Hip Ratio (WHR) are indicators for abdominal adiposity [15]. The higher the BMI, the greater the waist circumference, and the more risk factors, the greater the urgency to treat obesity [19, 15]. Obesity is regarded as a major contributor to the

global burden of chronic disease and disability [1]. Often coexisting in developing countries with under-nutrition, obesity is a complex condition, with serious social and psychological dimensions, affecting virtually all ages and socioeconomic groups [1]. Both waist circumference and WHR have been shown to disease risk when used alone. This is particularly the case for older persons who, as they age, tend to lose muscle mass and gain fat mass. When evaluating a patient's disease risk in relation to their weight, height, and body fat distribution, BMI and circumferences of the waist and hip should be used [20, 19].

The location or distribution of adipose tissue within the body is an important concept when considering the health implications of overweight and obesity [22, 23]. In this study, 70.15% of the respondents had very high percentage body fat, 16.17% had high percentage total body fat, and only 13.86% had normal percentage body fat. Also, only 41.79% of the respondents had a normal visceral fat level (≤9), 34.83% had high visceral fat level (10 – 14) and 23.38% had very high visceral fat level (≥15).

In Nigeria and other African cultures, overweight and obesity are socially acceptable as sign of affluence. Also, it has been reported that obesity is seen among affluent business executives and middle aged females with sedentary lifestyles [24, 25]. A study noted that work patterns in Africa are becoming sedentary due to improvement in technology and civilization [26]. In another similar report, it was found that most jobs in the civil service are sedentary and basically involves spending hours in the office sitting [27]. However, contrary to previous studies, this study found that 79.9 % of the respondents engaged in different kinds of exercise and only 20.1 percent do not at all. Although, the study revealed that only 0.2% of the respondents did exercise for the purpose of body building, 65.4% participated in exercise to keep fit while 27.1% did to lose weight and only 7.2% took it as a hobby.

This study showed that 12.8% of the respondents had raised serum cholesterol. The body uses cholesterol to synthesize bile in the liver, build body cells and produce hormones [19, 15]. However, excessive cholesterol in the blood can build up inside arteries to form plaque. Large amount of plaque is a risk factor for cardiovascular diseases, hypertension and stroke [20]. Also hypercholesterolemia could result to cholesterol stones in the gall bladder [4]. Hypercholesterolemia could be as a result of obesity, dietary and lifestyle habits [7, 1, 28]. This study showed that there is a positive correlation between cholesterol and BMI, %body fat, % skeletal muscle, visceral fat, waist circumference and hip circumference at P-value < 0.001.

be useful in assessing body fat distribution and evaluating disease risk. The key concept is that fat deep within the abdomen and around the intestines and liver increases disease risk. Because BMI does not distinguish between lean tissue and adipose tissue or indicate how fat is distributed, it cannot predict

Conclusion

There is very high prevalence of overweight and obesity among civil servants in Bida. Obesity was higher among females than males. There is also high prevalence of hypercholesterolemia among the population. Many of the civil servants were administrative workers and hence live sedentary lifestyle even those that participate in exercise were not regular and hence do not meet the require minimum of recommended 150 minutes of moderate physical activity per week.

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