Baseline Anthropometric Measurements and Obesity of People Working in Isale-Oko, Sagamu, Ogun State, Southwest, Nigeria

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Abstract

Objectives: It is uncertain anthropometric measurements are affected by the type of job an individual is doing in an environment. Therefore, this study was designed to assess the baseline anthropometric measurements with relation to obesity of people working at a motor park in Sagamu. **Design:** This is a cross-sectional study of 139 individuals working in the motor park of Isale-Oko, Sagamu, aged 20–70 years. Passengers were exempted. The weight in kg and height in meters of each participant were measured. The waist circumference (cm) (WC), hip circumference (cm) (HC), and thigh circumference (cm) of each participant were measured using a flexible tape. The waist-to-hip ratio (WHR) was calculated. The body mass indexes (BMI) (kg/m^2) and the waist-to-thigh ratio were calculated. Data were analyzed using descriptive statistic and ANOVA. **Results:** The occupational distributions include the drivers, conductors, traders, and garage staff. Young participants contribute to 60.4% of the study populations. There were 64.3% young participants among the conductors, 63.2% of the drivers, 64.8% of the traders, and 40% of the garage staff. The mean BMI of the drivers showed that they tend to be obese (30.85 ± 0.66 kg/m^2). Conductors tend to be overweight with BMI of 26.57 ± 0.60 kg/m^2. The WC of drivers was significantly highest among the occupational groups 98.82 ± 1.75 cm, while the conductors had the least WC 94.38 ± 2.87 cm. The traders had the highest HC 106.31 ± 1.88 cm. The drivers and conductors had the highest WHR of 0.96 ± 0.03 and 0.92 ± 0.01, respectively. **Conclusions:** The anthropometric parameter measurements of individual participants obtained from this study can be used as baseline for the future study. The high BMI and WC in drivers and high HC in traders increase the risk of developing diabetes mellitus.

Keywords: Body mass index, hip circumference, thigh circumference, waist circumference, weight

Introduction

Since ancient times, the human body has been measured for several reasons. During the ancient era, human body measurement was mostly practiced for the figurative arts. Eventually, the practice was adopted by the naturalist field and then by anthropologists to identify human basic morphological characteristics. The term anthropometria dates back to the 17th century in the naturalist field, when it first appeared in the short manual Anthropometria by Ulijaszek *et al*.[1]

The manual seems to be the earliest recorded material that investigated the human body for scientific and medical purposes. It introduced a quantitative approach to seek information concerning variations and changes in the forms of organisms that described the relationship between the human body and disease.[2]

At the prompting of these academics, "the season of measures" began, and practitioners started to believe in the practical application of numbers, making use of mathematics, geometry, and statistics and anthropometers."[3]

The anthropologists' prior object of investigation was "the skull," which they believed represented the most important part of the body. The anthropoeletrical method became more popular in several fields due to the research of Adolphe Quetelet in the 19th century.[3] During this period, the new conceptualization of human diversity advanced this practice for the creation and validation of racial typologies.[1]

This indicated that body size was a signal for the quality of life. Thus, anthropometric practices could be used as a tool

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for social welfare, whereas factors such as culture, society, behavior, and the political economy played important but distant roles in the outcomes of growth and body size.[1]

Anthropometry is the measurements of size and properties of human individual. It is taken from Greek language, anthropos-human and metron-measurements. It allows us to understand physical variations. It is systematic measurements, primarily body size and shape on comparative basis. Principally, these measurements are of four types, namely: body mass index (BMI), waist-to-hip ratio (WHR), skinfold tests, and bioelectric impedance.

WHR for woman should be <0.80, while in men, it should be <0.90. Normal variables showed that that the waist circumference (WC) should be 25% less than the shoulder, hip, bust measurements, and 20–25 cm less than hip and bust measurements. The visceral fat of <0.85 in female and 0.90 in male is good, but when there is an increase in visceral fat, there is an increased risk of development of diabetes mellitus (DM), cardiovascular disease, and stroke. Hence, engaging in exercise and unsaturated fat intake will prevent all these.[1]

BMI of <24.5, WHR of 0.86, and WC of 77 cm are good. It suffices to say in females that apple appearance is bad, while Pears appearance is good. There are charts for all these measurements, for example, WHR >1.0 can be a pointer to an increased risk of development of heart disease.[2]

Therefore, this study was designed to assess the baseline anthropometric measurements in relation to obesity of people working at motor Park in Sagamu in Ogun State, Southwest, Nigeria.

Methods

This is a cross-sectional study of 139 participants working in Isale-Oko, Sagamu, Ogun State, Southwest, Nigeria, aged between 18 and 70 years. Passengers in the parks were exempted from this study because they were not working at the park.

The weight in kg of participants were recorded in kilograms (to the nearest 1.0 kg) without them wearing any heavy clothing such as a coat, jacket, shoes, or agbada, using a calibrated bathroom scale (Soehnle-Waagen GmbH and Co. KG, D 71540 Murrhardt/Germany) positioned on a firm horizontal surface.

Height in meters of participants were measured (to the nearest 0.1 m) using a stadiometer (Prestige HM0016D, India) and to the nearest 0.1 m.

Participants stood erect, without shoes and headgears, on a flat surface with the heels and occiput in contact with the stadiometer.

The BMI was subsequently calculated using the formula: Weight (kg)/height^2 (m^2).

The WC of each participant was measured using a flexible tape measure to the nearest 1 cm at the level of the umbilicus with the individual standing and breathing normally.

The hip circumference (HC) of each individual was measured with the same tape measure to the nearest 1 cm at the level of the greater trochanter. The WHR was then calculated.

The thigh circumference (TC) of each participant was measured with the same tape measure to the nearest 1 cm at the level of the mid-point between the anterior superior iliac spine and the superior border of the patella. Consequently, the waist-to-thigh ratio was also calculated using the formula: WC (cm)/TC (cm). All measurements were taken by researcher with the aid of an assistant to cross-check that the tape measure did not slant.

Study procedure

The following definitions were utilized:

Central obesity: WC ≥102 cm (males) ≥88 cm (females) or WHR ≥0.90 (males) ≥0.85 (females)

BMI category
- Underweight – BMI <18.5 kg/m^2
- Normal weight – BMI 18.5–24.9 kg/m^2
- Overweight – BMI 25.0–29.9 kg/m^2
- Obesity – BMI ≥30 kg/m^2.

Age category
- Young age: Age 15–39 years
- Older age: Age 40–70 years.

Ethical approval and informed consent

Ethical clearance for the study was obtained from the Committee on Human Research Publication and Ethics of the School of Olabisi Onabanjo University Teaching Hospital, Sagamu. All participants (139) of this study signed an informed consent form, in accordance with the committee regulations, before completing a questionnaire and taking their anthropometric measurements.

Statistical analysis

The data obtained were analyzed using computer statistical program package SPSS version 25.0. $P < 0.05$ was considered statistically significant.

Results

The occupational distributions include the drivers, conductors, traders, and garage staff. Table 1 shows that all drivers (38) were male. Majority of traders were female (40 out of 43). Table 2 shows that young individuals contribute to 60.4% of the study populations. There were 64.3% young individuals among the conductors, 63.2% of the drivers, 64.8% of the traders, and 40% of the garage staff. Table 3 shows that the mean BMI of the drivers were obese (30.85 ± 0.66 kg/m^2). Conductors were overweight with BMI of 26.57 ± 0.60 kg/m^2. The WC of drivers was significantly highest among the occupational groups 98.82 ± 1.75 cm, while the conductors had the least WC 94.38 ± 2.87 cm. The traders had the highest HC of 106.31 ± 1.88 cm. The drivers and conductors had the highest WHR of 0.96 ± 0.03 and 0.92 ± 0.01, respectively.

Discussion

The drivers have highest anthropometric parameters because they are fond of excessive lifestyle, especially with nutrition. The male preponderance is due to the fact that most of those that normally work in the garage are males. Rarely will someone find a female doing commercial transportation across the state.

This study demonstrates that the traders and drivers in this study have a higher mean BMI, mean HC, and WC when compared with the other individuals in this study.

This similarity in the prevalence may be due to the same sedentary lifestyle associated with traders and other related occupations found at motor parks. This may also be attributable to degree of urbanization and adoption of westernization observed in this area, as it is close to Lagos (the most populous area of Nigeria and one of the fastest-growing cities in the world) where there has been a record of high prevalence of obesity/overweight owing to the adoption of the westernized culture.[4]

Increased abdominal fat distribution as demonstrated by a significantly higher WHR has been reported as a characteristic feature of the first-degree relative of person with type 2 DM.[5]

Groop *et al*. were of the opinion that a family history of type 2 DM influenced body fat distribution resulting in abdominal obesity. While WC and WHR are both considered anthropometric indices reflecting abdominal obesity, some longitudinal studies have shown WC as a better predictor for the development of type 2 DM.[6]

It has also been shown that relative to WHR, WC measures showed stronger association with visceral adiposity.[7] It is noted that the findings in this study of similar WHR in drivers and traders is in line with the findings of Groop *et al*., a study conducted on Caucasian population. They reported a significantly higher WHR in the first-degree relatives of type 2 diabetics than in nondiabetics, despite similarity in BMI.[5]

It is possible that body fat distribution and anthropometric measurements show ethnic variability, and this might be responsible for the differences observed in those studies. In a cross-sectional study conducted to determine anthropometric factors associated with type 2 DM in randomly recruited population, there were much greater odds of having type 2 DM when WHR rather than WC was considered.[8]

This is in direct contrast to the findings of Wei *et al*., who conducted a prospective 7-year study and found that WC was a much better predictor than WHR of the development of type 2 DM. These observations led Hans *et al*. to suggest the possibility that excessive intra-abdominal fat causing an increased risk of developing type 2 DM, but that the development of DM may then affect HC in some way reducing hip size and thus increasing WHR.[8]

The anthropometric indices of WC and WHR are surrogates for intra-abdominal (visceral) fat depot. The detrimental influence of abdominal obesity on metabolic processes is thought to be mediated by the intra-abdominal fat deposit. A preponderance of enlarged fat cells in adipose tissue increases the risk of glucose tolerance, hyperinsulinemia, and hypertriglyceridemia.[9]

Table 1: Gender distributions of the participants

Occupation	Male	Female	Total
Drivers	38	0	38
Conductors	19	9	28
Garage staff	15	15	30
Traders	3	40	43
Total	75	64	139

Table 2: Age distributions of the participants

Age distributions (years)	Drivers (%)	Conductors (%)	Garage staff (%)	Traders (%)	Age distribution (Participants)
Young subjects (20-39)	24 (63.2)	18 (64.3)	12 (40)	30 (64.8)	84 (60.4)
Older subjects (40-70)	14 (36.8)	10 (35.7)	18 (60)	13 (30.2)	55 (39.6)
Total	38 (100)	28 (100)	30 (100)	43 (100)	139 (100)

Table 3: The relationships between variables and different occupations of motor-park workers

Mean Variable	Drivers	Conductor	Staff	Traders	*F*	*P*
Weight (kg)	84.00±2.16	74.00±2.43	62.36±1.55	67.28±2.50	5.500	0.001*
Height (m)	1.68±0.01	1.68±0.02	1.68±0.01	1.62±0.02	4.340	0.006
BMI (kg/m^2)	30.85±0.66	26.94±0.60	22.05±0.46	25.54±0.97	7.747	0.000*
WC (cm)	98.82±1.78	94.38±2.87	88.53±1.34	94.57±1.91	4.240	0.007*
HC (cm)	104.03±1.96	91.00±1.90	99.85±1.03	106.31±1.88	2.664	0.050
TC (cm)	57.61±0.69	53.38±0.25	57.33±1.00	59.86±0.93	10.227	0.000*
WHR	0.96±0.03	0.92±0.01	0.87±0.01	0.88±0.01	4.337	0.006*
WTR	1.72±0.03	1.77±0.07	1.61±0.04	1.58±0.03	8.843	0.000*

*Significant at P<0.05. BMI: Body mass index, WC: Waist circumference (male:female - 94:80), HC: Hip circumference (0.95), TC: Thigh circumference (0.55), WHR: Waist-to-hip ratio (male: female - 90:80), WTR: Waist-to-thigh ratio (<1.50)

(Chattopadhyay, 1981, in their study on body fat in urban and rural male college students of Eastern India. Eastern India were classified into two groups- urban and rural, were studied. They studied anthropometric measurements of skinfold thickness in several sites of the body to determine their body fat content. The mean value of percentage of body fat was found to be significantly higher in the urban group of students than in the rural. The mean values of skinfold thickness of the biceps, triceps, and subscapular regions were also found to be higher in urban, but no such significant differences in mean values of suprailiac and abdominal skinfolds were found between the two groups of students.[10]

Aberle *et al*., 2009, in their study employed the comparison anthropometrical parameters of their 4-year-old children in the urban and rural Slavonia, Croatia, between 1985 and 2005. The aim of the study was to identify the secular trends in the anthropometrical parameters of the 4-year-old children in Slavonia, Croatia, and the nearby rural area by comparing data of height, weight, and mid-arm circumferences from 1985 onward.[11] Similar results were obtained for BMI. There are differences in height and BMI between youth raised in urban versus rural areas, and positive growth trends of height and BMI over time (1990s vs. 2000s) in youths in Human Province of China.[11]

Excess body fat is well documented as being a risk factor for numerous chronic conditions such as diabetes, hypertension, hyperlipidemia, and cardiovascular diseases.[12] Studies of anthropometric measures among adult populations of Sub-Saharan Africa countries are limited and weight and BMI are the most common indicators which have been used to assess overweight and obesity prevalence. The Cameroon Burden of Diabetes Baseline Survey, was the first large-scale study of cardiovascular risk factors, using standardized methodology, to be conducted in Cameroon, and the first using the WHO STEPS methodology from Sub-Saharan Africa. This study updates the data on overweight and obesity using a range of anthropometric parameters in the adult population of men and women living in urban area of Cameroon.

This study highlights the high prevalence of overweight and obesity in motor-park workers, whether measured by BMI, WC, or WHR and highlights the emergence of noncommunicable diseases and their risk factors as major contributors to the burden of ill-health in Sub-Saharan Africa, particularly among urban populations.

Obesity as estimated by BMI (a measure of total body fat) and central obesity as estimated by WC and WHR were low among men in the younger age group. The anthropometric measurements except WHR were strongly correlated with each other. The correlation of indices of overall and central obesity is highly suggestive of an association between increased overall obesity (as measured by BMI) with increased visceral fat (WC). We found that mean WC, more than WHR, increased across overall obesity (BMI) categories in all the workers. Similar results were reported in the urban female population of Morocco by Belahsen *et al*.[13] and by Sargeant *et al*. in the urban adult population of Jamaica.[14] It is likely therefore that BMI and WHR provide different measures of almost the same phenomenon.

Visceral fat is more metabolically active than subcutaneous fat and hence may be more deleterious to health.[15] Several studies have found a strong association between visceral fat and cardiovascular risk factors.[6,16-18] WC is a practical measure of intra-abdominal fat mass[17] and recommendations have been formulated to use it in the identification of people in need of intervention for cardiovascular risk reduction.[19-21] These findings suggest that defining obesity on the base of WC may be an equally or more valid and useful method for use in epidemiological research and clinical practice, though further research is needed to demonstrate this unequivocally.

Studies in developed countries show an inverse (negative) relationship between education and obesity, particularly among women: the lower the education or the social class, the higher the prevalence of obesity. However, in developing societies, a strong positive relationship often exists between socioeconomic status and obesity among men, women, and children.[22] The findings suggest that WC as a measure of central obesity is a useful indicator for use in epidemiological studies and clinical practice. The study provides insights into the relationship between age, sex, socioeconomic overweight, and obesity using a range of anthropometric parameters. Based on BMI alone, the study showed a high prevalence of overweight and obesity and provides evidence to support the establishment of intervention programs to prevent further increase in obesity-related disorders such as diabetes and hypertension in urban Sub-Saharan African populations. Meanwhile, further studies need to be carried out to provide appropriate cutoff points and identify which anthropometric parameter has the highest predictive value in the identification of subjects at risk of obesity-related disorders.

Conclusions

The types of occupation of participants in the motor park are related to differences in the anthropometric parameters in this study. The anthropometric parameter measurements of individual participants obtained from this study can be used as baseline for the future study. It is suffice to say that high BMI and WC in drivers and high HC in traders increase the risk of developing DM.

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Conflicts of interest

There are no conflicts of interest.

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