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Ayodeji Ayodele Fabunmi
Physiotherapy Department, College of Medicine, University of Ibadan, Nigeria

Odumesi Olufemi Olufemi
Physiotherapy Department, College of Medicine, University of Ibadan, Nigeria

Abiodun E Orotokun
Physiotherapy Department, Bowen University Teaching Hospital, Ogbomoso, Oyo State. Nigeria

Correspondence
Ayodeji Ayodele Fabunmi
Physiotherapy Department, College of Medicine, University of Ibadan, Nigeria

Prevalence of obesity among secondary school teachers in Ibadan North Local Government Area, Ibadan, Oyo State, Nigeria

Ayodeji Ayodele Fabunmi, Odumesi Olufemi Olufemi and Abiodun E Orotokun

Abstract
World health organization data shows that prevalence of overweight and Obesity increased twenty percent between 2002 and 2010 and this is becoming a serious public health problem. Secondary school teachers are believed to be physically inactive with a high possibility of accumulating body fat. This study was carried out to determine the prevalence of obesity among secondary school teachers in Ibadan North Local Government Area, Oyo State. The study was a cross sectional survey. Percentage body fat, body weight and height were measured. Body mass index was calculated from weight and height of each participant using the Quetelet Index formulae (W/H^2). Three hundred and forty-five secondary school teachers (247 females and 98 males) were randomly selected from 10 secondary schools within Ibadan North Local Government Area, Oyo State voluntarily participated in the study. Age range of participants was 22- 59 years with mean age of 43.53 ±7.11 years. Six (1.7%) teachers were underweight, 156 (45.2%) teachers were within normal range of BMI, 114 (33.0%) teachers were found to be overweight, 43 (12.5%) were classified under obese I, 22 (6.4%) teachers were classified under obese II and 4(1.2%) teachers were classified under obese III. In all Sixty nine (20.1%) teachers were classified as obese. The result of this study also showed that there is a significant direct relationship between weight, percent body fat, body mass index and age. There was also significant direct relationship between weight, percent body fat, body mass index and length of service as teachers. It was concluded that almost half of the participants were either overweight or obese.

Keywords: Prevalence, Obesity, Body mass index, Percent body fat, Teachers

Introduction
Body Mass Index (BMI) is a height-adjusted weight measure that is calculated by dividing measured weight (in kg) and height (in meters) and expressed as kilograms divided by meters-squared (kg/m^2) [1]. BMI is used for classification of individuals into weight categories such as underweight, normal, overweight, obesity class I, II and class III [2]. BMI (quetelet index) is reported to be the most common measure used to define overweight and obesity in children, adolescents, and adults [3]. According to the World Health Organization classification of obesity, a BMI less than 18 is considered underweight, a BMI from 18.5 to 32.5 denotes a normal range, BMI $\geq$ 23 is considered to be indicative of overweight while a BMI $\geq$ 30 is considered to suggest obesity [4]. The International Obesity Task Force (2002) reported that in Nigeria, the mean BMI is 20.9 for males and 21.8 for females between the ages of 30 and 44 years [5].

Body fat percentage (PBF) represents the amount of the total body weight comprised of fat. Many formulae are available to predict adult Body Fat Percentage, based on current BMI, age, and gender [6]. One of these formulae is: PBF = (1.2x BMI) + (0.23 x age) – (10.8 x gender) - 5.4 where male gender = 1 and female gender = 0 [7]. This formula gives valid estimates of body fat in adults except obese subjects. In obese subjects, the formula slightly overestimates the PBF. The prediction error is comparable to the prediction error obtained with other methods estimating PBF, such as skin fold thickness measurements or bioelectrical impedance analysis [8].

Obesity is defined medically as a state of increased body weight, more specifically adipose

tissue, of sufficient magnitude to produce adverse health consequences [9]. Ganong (2001) also defines obesity as body fatness significantly in excess of that consistent with optimal health [10]. The worldwide epidemic of obesity is reaching critical proportions. An estimated 250 million people in the world are obese, and this number is predicted to reach 300 million by 2025. Obesity is the primary risk factor for the development of impaired glucose tolerance, type 2 diabetes mellitus, and the metabolic syndrome. The prevalence of type 2 diabetes among children and adolescents has increased at an alarming rate during the last three decades, with the highest prevalence among African American adolescents [11]. Obesity is a major risk factor for a number of non-communicable diseases, including coronary heart disease, hypertension, osteoarthritis, gallbladder disease and some forms of cancer [12]. Obesity has joined the ranks of chronic diseases that have displaced under nutrition and infectious diseases as the major killers of people [13]. A study by Akinpelu *et al*. [14] on adolescents in urban Sagamu community showed that the prevalence of overweight seems high in both genders 0 to 8.1% and 1.3 to 8.1% in males and females respectively while obesity's prevalence was low as 0 to 2.7% and 0 to 1.9% in males and females respectively [14].

An important factor contributing to obesity is the imbalance between energy intake and energy expenditure [15]. In other words, if an individual's calorie intake exceeds his/her body's metabolic need, the extra calories are stored as fat. When enough calories to meet the body's energy needs are not taken in, such individual's body will turn to the stored fat to make up the difference. Exercise helps ensure that stored fat, rather than muscle tissue, is used to meet the body's energy needs. If calorie intake equals energy expenditure, the weight will stay the same [16].

According to a global estimate by the World Health Organization (2006), there were about 1.6 billion overweight persons aged 15 years and above and among them at least 400 million adults were obese [17]. The revision of the definition of obesity to adjust for the racial differences, by the WHO, has resulted in a higher prevalence of 1.7 billion people classified as overweight. The WHO estimated 2-3 billion adults was overweight in 2015 while more than 700 million was obese [17]. In many of the urban centers of developing countries like Nigeria, a change in lifestyle due to increased affluence and sedentary lifestyle has been observed and it has been shown that such changes are important factors in the global epidemic of obesity [18]. In addition, a study conducted by Cunningham (1983) on a group of teachers showed that high levels of stress related to inordinate time demands, inadequate relationships, large class sizes, lack of resources, isolation, fear of violence, role ambiguity, limited promotional opportunities, lack of support, etc result in a number of emotional and physical and psychosomatic illnesses such as obesity, malnutrition and cardiovascular conditions[19].

This study intends to determine the prevalence of obesity among secondary school teachers in the Ibadan North Local Government area.

Methods

A cross sectional survey design was used for this study and teachers were selected from the public schools in Ibadan North Local Government area using a random sampling technique.

Ethical approval for the study was sought and obtained from the University of Ibadan/University College Hospital (UI/UCH) Health Research Ethics Committee before the commencement of this study with ethics assigned number UI/EC/12/0131. Approval to carry out the study was also sought from the principals of the selected secondary schools to carry out the study within their school premises. Informed consent was also sought from the participants after the purpose and procedure of the study had been explained to them.

Participants

Participants were recruited from among apparently healthy teachers actively engaged in teaching in the selected public secondary schools in the Ibadan North Local Government area. Only teachers who volunteered after due explanation of the procedure were allowed to participate in the study. Pregnant teachers were excluded from the study.

Instruments

The following instruments were used for data collection.

1. Weighing Scale: A weighing scale (Seca, Germany) was used to measure body weight. The weighing scale is calibrated from 0 to 200kg.
2. Height Meter: A height meter mounted on a wooden platform for portability and calibrated in centimeters from 20-210cm was used to measure height of participants in meters and recorded to the nearest 0.01 meters.
3. Omron Body Fat Monitor: Omron body fat monitor model BF 302 (Omron Health Care, Netherlands) was used to measure percent body fat.

The following measurements were taken, using the designated instruments;

1. **Height:** The vertical distance from the floor to the top of the participant's head, was measured while he/she was standing erect, and looking straight ahead with the use of a height meter.
2. **Weight:** The weights of the participants were measured by asking each subject to stand on the weighing scale barefooted. The subjects maintained an erect posture while their weights were noted and recorded.
3. **Body Mass Index:** This was calculated using the formula;

$$\text{BMI} = \frac{\text{Body Weight}}{\text{Height}^2} \ (\text{kg/m}^2)$$ [21]

Data analysis: Descriptive statistics of mean, standard deviation, and frequency tables were used to summarize all recorded variables (age, length of service, weight, height, BMI, percent body fat). Percentages were used to describe the gender difference between the classes of BMI. Pearson product moment correlation (r) was used to investigate the relationship between the following age length of service and BMI. Chi-square was used to investigate the influence of Gender on BMI and percent body fat and marital status on BMI and Percent body fat. Statistical level of significance (α) was set at 0.05

Results

Two hundred and forty-seven (71.6%) participants were females while ninety-eight (28.4%) were males. Twenty teachers (5.8%) were single, three hundred and twenty five (94.2%) were married. The participant's age ranged from 22 to 59 years. Both males and females were divided into four (4) age groups. The modal age of the group was Group III

(41-50 years) with one hundred sixty teachers (46.4%), Group I (20-30 years) with fourteen teachers (4.1%), Group II (31-40) with one hundred and ten teachers (31.9%), Group IV (51-60 years) with sixty-one teachers (17.7%).

The height of the participants ranged between 1.43 m and 1.96 m. The mean values for the male,female and all participants are recorded on table 3. The participants weighed between 45 kg and 117 kg. The participants had a BMI ranging between 14.81 kg/m^2 and 45.70 kg/m^2. The participants percentage body fat ranged from 4.5% to 45.8%. One hundred and four teachers (30.1%) had spent 1-10 years, 162 teachers (47%) had spent 11-20 years, 57 teachers (16.5%) had spent 21-30 years, 22 teachers (6.4%) had spent 31-40 years.

The association between BMI and gender was investigated using chi square analysis. Results showed that there was significant association between gender (x^2 = 333.537, p< 0.001) and BMI. There was also significant association between marital status (X^2 = 314.481, p< 0.001) and BMI. There was a significant association between marital status and percent body fat (X^2 = 267.176, p< 0.001) as shown on table 2

The relationship between age, length of service and BMI was investigated using Pearson product-moment correlation coefficient. The correlation coefficient (r) values obtained are recorded in table 3. Results showed a significant relationship between BMI and age (r = 0.214, p< 0.001) as well as BMI and length of service (r = 0.250,p<0.001). The relationship between age, length of service and percent body fat was investigated using pearson product-moment correlation method. Results showed a significant relationship between percent body fat and age (r = 0.341, p<0.001) as well as percent body fat and length of service (r = 0.404, p< 0.001).

Table 1: Demographic Characteristics of all Participates in The Study

Body Mass Index (Kg/m^2)							
Age Years	**Under Weight <18.5**	**Norma weight 18.5– 29.4**	**Over weight 25.0-29.9**	**obese I 30.0-34.9**	**Obese II 35.0-39.5**	**Obese III >40.0**	**Total**
21-30	0 0.0%	10 71.4%	1 7.15%	2 14.3%	1 7.15%	0 0.0%	14 4.1%
31-40	6 5.5	53 48.2	36 32.7	10 9.1	4 3.6	1 0.9	110 31.9%
41-50	0 0.0%	70 43.7%	51 31.9%	27 16.9%	10 6.2%	2 1.3%	160 46.4%
51-60	0 0.0%	23 37.7%	26 42.6%	4 6.5%	7 11.5%	1 1.6%	61 17.7%
Total	6 1.7%	156 45.2%	114 33.0%	43 12.5%	22 6.4%	4 1.2%	345 100.0%

Key:
BMI = Body mass index
% = Percentage

Table 2: Association between Gender, Marital Status and Body Mass index; percent body fat and Gender and Marital

Variables		X^2	P value
Body mass Index	Gender	333.527	0.001
	Marital Status	314.481	0.001
Percent body fat	Gender	282.552	0.001
	Marital status	267.176	0.001

α-Level = 0.05; KEY: X^2 = Chi-square; S = Significant

Table 3: Relationship between Demographic Characteristics and Body mass index using Pearson Product Moment Correlation Coefficient

Variables		r	p value
BMI	Age	0.214	0.001
	Length of service	0.250	0.001
Percent Body fat	Age	0.341	0.001
	Length of service	0.404	0.001

Discussion

Over seventy percent (71.6%) of the participants were females and less than thirty percent (28.4%) were males. This shows a female domination in the profession. The age of participants ranged from 22 to 59 years. The participants had a BMI ranging between 14.81kg/m^2 and 45.70kg/m^2. Classification after WHO (2006) shows that more than half (53.1%) of the sample population were above the normal weight to height ratio.

Results showed a significant relationship between BMI and age (r=0.214, p =0.001) as well as between percentage body fat and age (r=0.341, p= 0.000). This agrees to previous reports. The prevalence of obesity is reported to be strongly related to age. According to a publication by the Social Issues Research Centre Group, the 16-24 year age group- both males and females – is substantially less at risk of becoming obese than older age groups, and the incidence of obesity for males in this age range has declined very slightly in recent years. Those aged between 25 and 34 have the second lowest rates of obesity. Middle aged people and those of retirement age are the most 'at risk' groups.

Results also showed a significant relationship between BMI and length of service (r=0.250, p=0.000) as well as between percentage body fat and length of service (r=0.404, p=0.000). This could just be a carry-over effect of age as those with longer length of service will be older than those with shorter length of service.

Marital status is related to morbidity and mortality, with married people healthier and at lower risk of death than those who are unmarried (especially among men). However, the relationship between marital status and obesity has not been well established. Role theory suggests through a marital causation model that people in the marital role are less likely to be obese because of stigmatization. In the study of Sobal *et al*. (1992) [22], marital status was not significantly associated with fatness or obesity among women when other variables were controlled. The marital role appears to influence fatness and obesity among men, but not women.

In this present study the significant influence of marital status could possibly be attributed again to societal value. While in the developed society, through the marital selection model people in the marital role are less likely to be obese because of stigmatization, in this environment it is the opposite. A plump woman is seen as an evidence of a good caring by the husband and is therefore envied rather than stigmatized.

Conclusion

The BMI and the percentage body fat increase with length of service. The female teachers have higher BMI and percentage body fat than their male counterparts.

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