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Research Article

Physical Activity Level and Prevalence of Obesity among Adults' Population of Abeokuta, Ogun State, Nigeria

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Abstract

Objective: To examine the effect of physical activity level (PAL) on the prevalence of obesity among adults (20 - 64 yr) in Abeokuta, Ogun State, Nigeria.

Designs: 120 adult males and 120 adult females were randomly selected to participate in the study. Body mass index (BMI) was measured using cut-off ≥ 30 kg/m2 and the physical activity assessed according to WHO/FAO work classification.

Results: Mean BMI was high above the cut-off (7.2% for rural male and 11% for urban male, p = 0.169) and (28.3% for urban female but lower than the cut-off among rural female 7.7%, p = 0.006). The pattern of physical activity significantly fell on the sedentary side, mostly among the urban subjects. There were positive changes (statistically insignificant) in physical activity level (PAL) and a similar shift in obesity prevalence among the sub-population.

Conclusion: The PAL among the population, emphasize the adverse effect of sedentarism on the increasing risks of obesity and chronic degenerative diseases. Participation in physical activity programs should be emphasized.

Keywords: PAL; BMI; Adults; Obesity

Introduction

Physical activity plays a critical role in obesity development, because urban women are more sedentary than are their rural counterparts [11]. Sedentary lifestyles are increasing influencing the prevalence of obesity [11,17]. The process modern transport, labour saving devices, TV viewing etc. has brought about a number of consequences affecting physical activity patterns that contribute to obesity [4,8,30].

Over the years, large number of studies evaluating westernized dietary changes in various population in developing countries have been carried out, but little is known about the physical activity levels (PAL) in these populations [1,3,6,14-16]; which has been said to be due to difficulties in measuring total daily energy expenditure (TEE) in free-living situations [4,5,15,25,44].

PAL is needed to quantitatively compare the patterns of physical activity between urban and rural dwellers who shared the same genetic traits and cultural background (often seen in rural-urban migrants and rural residents of the same group), which should be useful for determining the effect of urbanization [22-24,40,41,43]. The PAL is useful as it allows for comparison of individuals of different body size. PAL values are a universally accepted expression of energy expenditure and help to convey easy understanding of the concept of physical activity pattern [6,27,28,31-33,35]. In this study, the effect of the physical activity level on the prevalence of obesity in both the rural and urban adults (20 - 64yr) in Abeokuta was examined.

Materials and Methods

In all, 240 adults (male = 120, female =120) representative sample within the age 20 years and 64 years were randomly and systematically selected from the enumerated households in both the rural and urban areas of Abeokuta (which is a city in Ogun State, western part of Nigeria in the western region of Sub-Saharan Africa). The inhabitants of the urban area are mostly elites and civil servants, living in modern structured residential buildings and settings. The samples were the participants that were measured and assessed, which represented the population of the localities that were selected for the study.

Validated questionnaires were used to record detailed information. The heights and weights of the subjects were taken to compute the BMI (kg/m^2) adopting the World Health Organization (2000) classification of body weight in adults: normal weight 18.5 - 24.9; Overweight 25.0 - 29.9; obese ≥ 30.0. The height measurements were obtained using calibrated standing rule and measured to the nearest 0.1 cm. The weight measurements were performed on the same digital scale, which was periodically checked for precision with known weights; and measured to the nearest 0.1kg. The data were taken in the morning, and all the subjects wore light clothing without shoes and socks; with their hands resting on their sides.

Physical activity patterns were based on the mode of transportation, number of hours devoted to sleep, type and nature of occupation, and recreational activities within the previous 24 hours. The duration of each activity was multiplied by its energy cost and summed up; using energy cost of activities as given by FAO/WHO/UNU [5,18,21,26]:

$TEE = (t_1\ AEE_1) + (t_2\ AEE_2) + (t_3\ AEE_3) + (t_n\ AEE_n)$

Where t_1, t_2, t_n= time (min)

AEE_1, AEE_2, - - AEE_n = Activity Energy Expenditure

PAL = TEE/BMR

= [(∑sleepingEE)+(∑sedentaryEE)+(∑moderateEE)+(∑activeEE)]/BMR [22,34-36,48]

Sleeping EE = BMR = 2MJ/8hr (male), 1.75MJ/8hr (female) [7,15,24,25,27].

Statistical analysis was performed with t-tests were used for comparison between the urban and rural subjects. Differences were considered to be significant at $p<0.05$. Results were expressed as means ± S.D and percentages [37,38,45,47].

Results

In the analysis of patterns of distribution of the anthropometric and physical activity characteristics of the subjects, according to their sex groups and localities/areas, using statistical computing shown in table 1 [37,38,45]. The mean values of body weights and heights were significantly moderate; but are higher among the urban subjects than the rural subjects except in the height of the rural females.

The mean BMI was also higher among the urban subjects than the rural subjects in both sex groups, which may be said to be associated with changes in lifestyles of the urban subjects as observed in this study. Mean BMI was higher above the cut-off among the rural male by 7.2% ($p = 0.169$), urban male by 11% ($p = 0.169$), urban female by 28.3% ($p = 0.006$), but fell among the rural female by 7.7% ($p = 0.006$).

The pattern of physical activity fell on the sedentary side significantly among the urban subjects than the rural subjects, as seen in the mean total energy expenditure. The TEE is lower significantly among the urban male (2191 ± 410) as compared to the rural male (2639 ± 344) by 17% ($p < 0.005$), and among the urban female (2092 ± 580) as compared to the rural female (2310 ± 530) by 9.4% ($p < 0.005$).

The main focus of this report is to evaluate the PAL value of the sampled population and compared with other findings, such as those described in [6,24,33]. The findings of this study compared very well with those described by [6] for developing countries (i.e. 1.85 ± 0.31 for males and 1.65 ± 0.17 for females, and that 1.8 was the threshold to trigger obesity). There were large, insignificant, positive changes in the PAL values of the urban subjects as compared to the rural subjects. The values as compared to the threshold, showed the rural male (RM) with +3.9% ($p < 0.005$), urban male (UM) with -2.8% ($p < 0.005$), rural female (RF) with +2.8% ($p < 0.005$) and urban female (UF) with -6.7% ($p < 0.005$) (Table 1).

Variables	Rural (n 60)	Urban (n 60)	p-value
Males (n 120)			
Body weight (kg)	75.6 ± 8.11	773 ± 7.63	< 0.001
Height (cm)	172.1 ± 8.5	179.6 ± 3.4	< 0.001
BMI (kg/m^2)	32.16 ± 3.63	33.30 ± 4.69	0.169
Total Energy Expenditure (kcal/day)	2639 ± 344	2191 ± 410	< 0.050
PAL (Physical Activity level)	1.87 ± 0.31	1.75 ± 0.24	< 0.050
%Obese (BMI 30 kg/m^2)	36.7	51.9	
% walking less than 1 hr/day	42	57	
% not participating in any PA or Sports	30	60	
Females (n 120)			
Body weight (kg)	81.5 ± 9.60	89.8 ± 17.5	< 0.001
Height (cm)	169.3 ± 5.2	163.8 ± 6.5	< 0.001
BMI (kg/m^2)	27.69 ± 6.01	38.49 ± 5.80	0.006
Total Energy Expenditure (kcal/day)	2310 ± 530	2092 ± 580	< 0.050
PAL (Physical Activity Level)	1.85 ± 0.49	1.80 ± 0.83	< 0.050
% Obese (BMI 30 kg/m^2)	53.3	62.3	
% walking less than 1 hr/day	52	72	
% not participating in any PA or Sports	38	65	

Table 1: Anthropometry, physical activity characteristics and % obesity of the subjects (n = 240) in the rural and urban areas.

Values are given as mean ± SD and percentage values within the sex group are compared with paired t-tests.

In addition, the relationship between the physical activity level and obesity was most evident in the prevalence, which was 36.7% among the rural male (RM), 51.9% among the urban male (UM), 53.3% among the rural female (RF) and 62.3% among the urban female (UF) (Table 1) and shown in figure 1 and 2 and when compared with those obtained globally in some other studies, they showed some similarities in their values and distributions around their percentages [32,33,40,41].

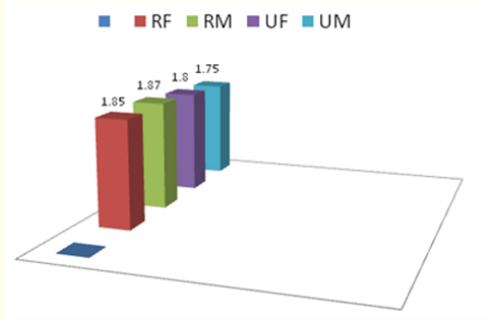

Figure 1: PAL values in relation to the areas and genders.

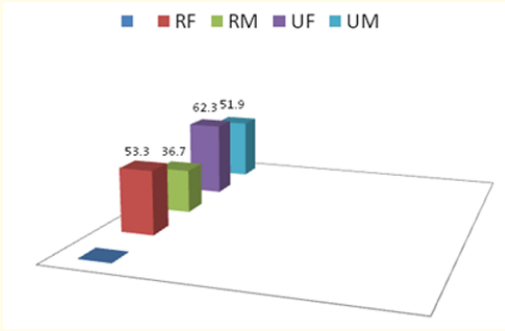

Figure 2: % prevalence of obesity in relation to the areas and genders.

Discussion

The BMI distribution and the physical activity level were in agreement with those described in [6,24], showing that the people were transiting towards sedentary lifestyles. Age was an aspect which greatly affects the number of hours spent sitting down at work, in leisure time as well as time spent walking [11,25,27]. The results revealed that most males engage in one sport or the other, or in running around for businesses, while their female counterparts are mostly in sedentary state even while working, which may have contributed to the high prevalence of obesity experienced among the females than the males; thus confirming the difference in the prevalence of obesity among sexes [11,19,20,36,40,41].

Cross-sectional studies have shown that increased acquisition of cars, labour saving household devices, TV, viewing etc. can make people to be walking less than 1 hour per day or making people not to be physically active or engage in any sports (Table 1); which have a number of consequences affecting physical activity patterns that are increasingly involved in the prevalence of obesity [1,8,17,30,32,40]. These studies also confirmed that physical activity pattern is most strongly associated with increasing prevalence of obesity in the world [2,10,11,19,30,32,40]. As can be seen from this finding and the figures 1 and 2 presented, that as PAL increases, the percentage prevalence decreases, and vice versa. Whereas some studies did not support that physical activity as reported in the freely living adult population in the long term is associated with the development of obesity, but the studies indicate that obesity may lead to physical inactivity [9,12,14,25,30,44]. There are some studies showing no association [3,13,20].

It has been well known for many decades that physical activity (PA) and exercise provide substantial benefits for the prevention of obesity, as well as overall health, functional capability, quality of life and longevity [23-26,28].

Although much progress has been made in this field, existing longitudinal epidemiological studies have found that PA levels are negatively correlated with weight gain. While some findings also relate the physical activity level (PAL) and body weight to the risk of developing cardiovascular diseases and coronary artery diseases in young adults [27-29]. Increasing PA levels from low to moderate ensures maintenance of body weight, while increasing PA levels from low to high helps individuals lose weight and reduced the risk of contracting CVD and CAD [30-32]. Showing and affirming that PAL would be a good predictor of the effects of incidence and prevalence of most of the obesity related diseases [2,28,29,42,46].

These findings, however, should be interpreted with some caution. Changes (persistence and non-persistence) in PA in this study were defined based on the levels of PA and the prevalence of obesity among the participants. In some cases, participants in the 'sedentary' group are not completely sedentary, and participants in the 'high' active group are not completely highly active. There are limitations in the result presented in the finding which could potentially underestimate the true effects of PA on obesity prevalence and the relative risk estimations [39,42,46]. One of them is the assessment of the correlation that exists between the PA and the percentage of the population that are obese. Future studies with more comprehensive longitudinal data analyses could provide data and evidence supporting the recommendation for the population to improve PAL and maintain this active lifestyle throughout their lifespan for the prevention of obesity, overweight and associated CVD [7,10,28,34].

Conclusion

The conclusions drawn from several recent reviews, although not fully adequate from the point of view of the problem discussed in this study, attest to the relevance of investigating whether various levels of physical activity are related to increasing prevalence of obesity. These results support the effect of physical activity level on the development and prevalence of obesity in the society. The study indicates that less physical activity leads to obesity and should encourage future studies into establishing the relationship between physical activity and obesity prevalence incorporating all other phenomena in the methodology.

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Author Contributions

The authors conceived and designed the experiments, performed the experiments, analyzed the data, interpreted the data, wrote the first draft, and contributed to the final paper. All authors approved the final version. All authors are involved in the preparation of manuscript.

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Conflict of Interest

The authors declare that they have no conflicts of interest.

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