Independent Effects of Age and Energy Expenditure on Obesity among Adults in Abeokuta, Ogun State, Nigeria

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Received: July 05, 2019; Published: November 15, 2019

Abstract

The purpose of the study was to assess the independent effects of age and energy expenditure on the risks of obesity among adults (20 - 64 years of age) in Abeokuta. A cross-sectional study where changes in age, changes in work and leisure-time, and physical activities information played roles. In all, 240 adult subjects of 120 females and 120 males (age: 20 - 64 yrs with cut-off for energy expenditure and Body Mass Index) in rural and urban localities in Abeokuta were assessed. Physical activity information determined the energy expenditure, while the Body Mass Index determined the risk of obesity among the subjects. The risks of obesity in the rural and urban areas strongly increased with increased age across the gender, while energy expenditure contributed to the risks in the urban population. Statistically, age has a strong and direct association with obesity in both rural and urban settings, while energy expenditure was inversed in its association. Findings from the this study showed that in developing societies, age tends to be a risk factor for obesity, whereas energy expenditure tends to be protective. Level of education and economic development are relevant modifiers of the influences exerted by these variables.

Keywords: Age; Energy Expenditure; BMI, Rural/Urban

Introduction

All over the world, obesity has reached epidemic proportion with over 1 billion overweight people and at least 30% of them are obese [1,8,12]. Baseline data are lacking and difficult to collect in some areas of the world, putting into consideration some other factor like race, colour; weather; sophistication, location, feeding practices etc [11,19,22,25]. Obesity is said to be an increase of 20% above normal weight for a specific sex, age, and height. Its symptoms is associated with inconveniences, decreased efficiencies, undue stress and strain, general physical weaknesses, predisposition to diseases that can shorten life span; with complications like Chronic Heart Diseases (heart attacks and hypertension), diabetes, stroke, diabetes mellitus, fatty liver, gall bladder disease, bronchial asthma etc [14,15,24,29,30].

Materials and Methods

It was a cross-sectional study where changes in age, work and leisure time, and physical activities information played major roles; with representative sample of 240 adults of 120 males and 120 females across two localities i.e. rural and urban. These were picked using

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systematic cluster sampling. The data were collected using: anthropometry (weight and height), physical activities (energy expenditure), personal information (age). The reference cut-off for BMI ≥ 30 kg/m² [2,7,28,30]. The International Obesity Task Force reference cut-off for energy expenditure: sleeping EE < 2.5 kcal/min; light EE 2.5 - 4.9 kcal/min; moderate EE 5.0 - 7.4 kcal/min; heavy EE > 7.5 kcal/min [3,13,14,25,27].

Results

The prevalence of obesity was shown in table 1, where it was lower in the rural areas 24% as compared to the urban areas 37.8%. It also showed that 33% of the males and 44% of the females were obese in the rural areas, as compared to 66.7% of males and 77.8% of females in the urban areas. The mean comparisons of the BMI in kg/m² were shown in figure 1. The prevalence was below average in the overall sampled population. The mean total energy expenditure in kcal/d was 2635 ± 242 for males and 1732 ± 403 for females; while the mean comparisons of the energy expenditure were shown in figure 2. Age was a relevant modifier of the influence exerted by these variables. Increased age has a strong and direct association with BMI, and energy expenditure was inverse in its association with BMI in both urban areas than the rural areas (p ≥ 0.05) (Table 2 and 3).

![Table 1: Prevalence rate of obesity in the sample population.](image)

![Figure 1: Comparisons of the mean values of BMI (kg/m²) across the age groups (20 - 64 yrs).](image)
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**Figure 2:** Comparisons of the mean values of energy expenditure (kcal/d) across the age groups (20 - 64 years).

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Rural-Age (Male n = 60)</th>
<th>Rural-Age (Female n = 60)</th>
<th>Urban-Age (Male n = 60)</th>
<th>Urban-Age (Female n = 60)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI kg/m²</td>
<td>0.376</td>
<td>0.692</td>
<td>0.708</td>
<td>0.895</td>
</tr>
</tbody>
</table>

*Table 2: Influence of Age on BMI kg/m².*

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Rural-EE (Male n = 60)</th>
<th>Rural-EE (Female n = 60)</th>
<th>Urban-EE (Male n = 60)</th>
<th>Urban-EE (Female n = 60)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMI kg/m²</td>
<td>-0.231</td>
<td>-0.422</td>
<td>-0.020</td>
<td>-0.556</td>
</tr>
</tbody>
</table>

*Table 3: Influence of Energy Expenditure on BMI kg/m².*

**Discussion**

It has become a global priority to determine what factors are contributing to the rise in obesity as well as to decrease the number of overweight and obese in developed and developing countries. Age and energy expenditure usually contributes as a risk factor for obesity [9,11,16,17]. The risks of obesity in the rural and urban areas are strongly increasing with increased age across the genders; and the prevalence level was lower in percentage to some clinical studies as shown by [5,29,30], which claimed that 69.4% of the subjects were either overweight or obese. This is also lower than the findings of a study done in Oyo state, Nigeria by [4] where it was discovered that majority 83.0% of the patients were either overweight or obese; which might be due to differences in location and feeding practices of the subjects which are also determining factors in predisposing them to obesity. The prevalence risk was higher among rural/urban females than their male counterparts, who also aligned with finding of [5,18,20,30] where high prevalence of obesity was higher in females than males in

agreement with the study of [6,9], making females to be more predisposed to obesity than males. This study also revealed that physically active men and women had slightly less chance to be obese as seen in the study by [5,10,16,18] who observed high prevalence of overweight and obesity among (46 - 75 yr) and (60 - 64 yr) subjects due to reduced physical activities. Also, perceived physical fatigability may reflect an imbalance between energy availability and demand [15,17]. Age contributes as risk factor for obesity and energy expenditure, as the energetic demands of any given weight-bearing physical task will increase as BMI increases, especially when this is explained by an increase in fat mass as seen in some studies, where individuals with higher BMI would be expected to report higher levels of physical fatigue. In previous NSHD analyses, higher BMI and greater length of exposure to obesity were shown to be associated with lower muscle quality at age 60 - 64 [19,21,23,26]; while on the other hand energy expenditure tends to be protective on both.

When completing any specified physical task those with higher BMI will thus also have lower capacity to complete the task, especially if they have been obese for longer, further increasing their risk of experiencing fatigue. One finding of an association between obesity earlier in adulthood and higher physical fatigability provides support for this explanation [16,18]. There was also some evidence to suggest this association may be stronger among women than men, possibly due to women's greater average fat mass for a given BMI.

This finding further discovered that increased acquisition of cars and energy-saving household devices; and increased food intakes brought about by increased wages, also contributed to the sedentary lifestyle which is also a risk factor. Authors of previous studies that have found higher physical fatigability among those who were underweight have suggested that this could be explained by the fact that low BMI often indicates underlying disease processes [16,18]. Thus, the number of cases of high physical fatigability attributable to underweight, would be much lower than for obesity, if this association was causal.

**Conclusion**

In conclusion, all these differences observed in this study between the rural and urban populations may call for further research to incorporate poverty eradication programs into nutrition policies to reduce the obesity epidemic among adults. Generally, good nutrition that is balanced, with variety and in moderation; combined with regular physical activities can be advocated.

**Acknowledgments**

The author has the sole responsibility for the opinions expressed which were based on the results of research thesis from Federal University of Agriculture, Abeokuta, Nigeria. They are not attributed to the sponsors or the editors of this publication. I acknowledged the contributions of the supervisors, reviewers and all other researchers and colleagues towards the success of this article.

The authors appreciate statistical support and expertise from the Statistical Consulting Group. We also thank the anonymous reviewers for feedback to improve the manuscript.

**Author Contributions**

Conceived and designed the experiments. Performed the experiments. Analyzed the data. Wrote the first draft. Contributed to the final paper. All authors approved the final version.

**Funding**

The authors received no specific funding for this project, but acknowledges previous salary support from the Academics Works.

**Bibliography**


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