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Prevalence and Determinants for Overweight and Obesity among Residents of a Mining Township in Kitwe, Zambia, in 2011: A population-based Survey

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Abstract

Background: Obesity and overweight in Africa have been attributed to demographic and nutritional changes that have resulted from urbanization and sedentary lifestyles and increased caloric intake without much physical activities. This has put populations at an increased risk of cardiovascular diseases, Diabetes mellitus, osteoarthritis, dyslipidemia, and cancer. The objective of this study was to determine the prevalence and associated factors for combined overweight and obesity among residents of a mining town, Kitwe, in Zambia.

Methods: A cross sectional study was conducted using a modified WHO global Non Communicable Diseases Surveillance Initiative STEPs 1 and 2 method of data collection. Proportions of study participants (25 years or older) who were overweight or obese were calculated. Logistic regression analyses were performed to determine associations between selected exposure variables and overweight/obesity.

Findings: A total of 1627 individuals participated in the survey, of which 42.3% were males. About half of the participants were of age 25-34 years (56.0%), and 41.7% had attained secondary level of education. The prevalence of overweight and obesity was 24.7% (21.0% among males and 27.3% among females, p=0.005) and 16.9% (8.0% among males and 23.5% among females, p<0.001), respectively. In multivariate analysis, age, sex, education level, sedentary lifestyle, smoking and blood pressure were significantly associated with overweight and obesity.

Conclusions: Health living through an intensive, comprehensive public health education and sensitization should be promoted in terms of regular exercises.

Keywords: Overweight and obesity, sedentary lifestyles, blood pressure, mining town of Kitwe, Zambia

Introduction

There is a growing global epidemic of overweight and obesity [1, 3] especially in high income countries such as the United States, England, Canada, and Australia [4]. In low and middle income countries, the World Health Organization (WHO) has warned that the escalating epidemic of obesity will place the populations at a risk of developing non-communicable diseases (NCD) [5]. The increase in the prevalence of overweight and obesity are attracting ever-increasing concern [6-8], because it has been observed that they are no longer diseases only of industrialized countries, but the incidence and prevalence are increasing even in the poorest nations [9, 10]. Many developing countries, especially in sub-Saharan Africa, are still battling with the burden of communicable diseases, such as HIV/AIDS, tuberculosis, and malaria [11]. Mortality from combined maternal and perinatal infectious diseases and nutritional deficiencies has been estimated to decline by 3% in the next 10 years, whereas mortality from NCD has been projected to increase by 17% [11]. Hence, WHO estimates that of the 64 million deaths worldwide by 2015, 64% (41 million) will be due to NCD if measures are not put in place to combat overweight and obesity. This has necessitated WHO to recommend continuous surveillance of the prevalence of obesity using the body-mass index [5, 11].

In Africa, obesity and overweight have been attributed to demographic and nutritional changes that have resulted from urbanization and the adoption of a western lifestyle [12], which include lack of exercises and changes in dietary intake [13, 14]. This has put populations at an increased risk of cardiovascular disease, diabetes mellitus, osteoarthritis, dyslipidemia, and cancer [15-18].

The increase in the prevalence of overweight and obesity calls for concerted programs to address primary prevention in low income counties, a practice that requires information on the magnitude of the problem and associated risk factors. At present, there is paucity of published data available in Zambia on obesity especially in the cities. The latest study conducted by Goma et al [19] in Lusaka showed that the overall prevalence of obesity was 14.2% in the general population, with a higher proportion of females (18.6%) than males (5.1%) being obese. Gender, age, education, cigarette smoking and blood pressure were found to be determinants of obesity. The prevalence and determinants of obesity and overweight may vary between communities and it is important that these determinants are established so that targeted interventions specific to that community are put in place to prevent overweight and obesity. The aim of this study, therefore, was to determine correlates for overweight or obesity in a mining township in Kitwe, Zambia.

Methods

Setting and design

Kitwe is located on the Copperbelt which is the mining province of Zambia. With a population of more than 570,000, it is the second largest city in terms of population and land mass in Zambia. The city is one of the most developed commercial and industrial areas in the country. It has a complex of mines within and around the city. Kitwe houses the Mopani, Konkola, and Nkana copper mines. These mines are one of the largest mines in Africa, and 95% of the copper which Zambia exports for its main revenue comes from this city. Apart from the mines, the smelters and the concentrates are also located in this city. There have been a lot of investments in the mines which has not only improved the operations of the mines but has also improved the infrastructure including eating outlets and supermarkets. In Copperbelt province, 34.3% of the population was poor compared to 60.5% of the population at national level in 2010 [20].

A cross sectional study was conducted using a modified WHO global NCD surveillance initiative NCD-STEPs 1and 2 [21] method of data collection. Details of the survey methodology have already been published elsewhere [19, 22].

Sample size and Sampling

A sample size of 1620 was determined upon considering a prevalence rate of 50±5%, a design effect of 2, a 95% response rate; and assuming an infinitely large population to sample from.

For administrative purposes, Zambia is divided into provinces that are further divided into districts. Districts are further divided into constituencies that are also divided into wards. Wards are further subdivided into Census Supervisory Areas (CSAs) that are also divided into standard enumeration areas (SEAs).

Participants who were all Africans were selected using a multi-stage sampling technique. Kitwe was divided in 5 constituencies: two constituencies comprising high cost housing and three comprising low cost housing. In the first stage of sampling, one out of the two high cost constituencies, and two from the three low cost constituencies we randomly selected. One ward was selected from each of the selected constituencies in the second stage of sampling. In the third stage of sampling, 6 CSAs were selected from the low cost residential areas, and four CSAs from the high cost residential area. Meanwhile, in the fourth stage of sampling, one SEA was selected from each selected CSA. In total 10 SEAs were

selected for the study. SEAs were selected using a systematic random sampling method. Finally from the selected SEAs, households were systematically sampled. All individuals (male or female) aged 25 years or older in a selected household were invited to participate in the study.

Data collection

The WHO global surveillance initiative for NCD [21] has three major steps in the collection of the data: first step: administration of the questionnaire, second step: the physical examination and the third step: involves biochemistry examination. Only the first and second steps were used for the purpose of this analysis.

Interviews

An interview schedule was used to elicit responses from the interviewees. The questionnaire was divided into sections among which were: demographic information, tobacco use, alcohol consumption, diet, sedentary behaviour, hypertension, weight and heights. The interviewers who included nurses and laboratory technicians underwent a 5 days intensive training course to equip them with the techniques of questionnaire administration and anthropometric measurement taking.

Measurements

It was recommended by WHO STEPS surveillance training practical manual that the physical examination should start with height, weight, waist circumference, and blood pressure. The blood pressure was taken after the questionnaire was administered. Only height, weight and blood pressure were used in our current analysis.

Blood pressure

The blood pressure of the participants was measured by the Omron Digital Automatic BP Monitor M4-1. Three minutes of rest was given to the participant in between three successive readings of blood pressure.

Height

To measure the height, the Seca Brand 214 portable stadiometer was used. Participants took off their shoes and head gear. They were requested to put their feet together and, the heels against the backboard and looking straight ahead before the reading could be taken. The measurements were taken to the nearest centimetre.

Weight

The weights were measured using the Heine Portable professional adult scale 737. The participants were requested to stand still, with their arms placed on the sides of the body. The measurements were taken to the nearest kilogram.

Variables

The outcome variable was overweight/obesity. The World Health Organisation (WHO) classification of BMI was used. BMI of 18.5-24.9 kg/m^2 was used as the reference (normal BMI). BMI of 25.0-29.9 kg/m^2 was used to define overweight and BMI of 30 or more kg/m^2 was used to define obesity. BMI was classified as either normal and was coded 0 or overweight/obese and in that case it was coded 1.

Independent variables were age, sex, education, Number of days ate vegetables in a typical week, number of days ate fruits in a typical week, number of hours spent on sitting or reclining on a typical day, alcohol, smoking status and blood pressure. The hypotheses were that the above variables are not associated with overweight/obesity. Age was obtained as a continuous variable but was categorized into 25-34, 35-44 and 45+ as recommended by WHO [21]. Male was coded as 1 and female 2. Whilst the highest completed level of education was obtained as no formal schooling, less than primary school, primary school completed, junior secondary school completed, senior secondary school completed, college/university completed, postgraduate degree or refused, it was categorised into none, primary, secondary or college/university, with refusal being declared as missing. Information on the number of day's participants ate fruits or vegetables were obtained by asking the following questions: "In a typical week, on how many days do you eat fruit?" and "In a typical week, on how many days do you eat vegetables?" The responses were categorized into 0-4 and 5-7 days for both variables. The question on sedentary behaviour was phrased as follows: How much time do you usually spend sitting or reclining on a typical day? The response was in hours and minutes; and was categorised into <1.5, 1.5-3.4, and 3.5 or more hours. Current alcohol consumption was defined as having consumed alcohol within the past 30 days to the survey; and the question was "Have you consumed an alcoholic drink within the past 30 days?" The responses were either a yes or no. The question on tobacco use was phrased as follows: "Do you currently smoke any tobacco product, such as cigarettes, cigars or pipes?" The responses were either a yes or no. Blood pressure readings that were obtained as continuous variables were categorised into Systolic blood pressure of 140 or more mmHg or Diastolic blood pressure of 90 or more mmHg as raised, otherwise normal.

Data management and Analysis

Two data entry clerks were trained to enter the data using Epi Data version 3.1. Data were double entered and validated. The data entry template had consistency and range checks embedded in it. Data analysis included computing BMI from the weights and heights (W/H^2) and categorising BMI into underweight, normal weight, overweight and obese. Prevalence of the outcome variables (overweight and obesity) was estimated. Bivariate and multivariate logistic regression analyses were conducted. In multivariate analysis, a backward variable selection method was used. Unadjusted odds ratios (OR), adjusted odds ratios (AOR) and their 95% confidence intervals (CI) are reported. Proportions were estimated using the Yates corrected Chi-square test; and a p value of less than 5% indicated a significant difference between two proportions.

Ethical considerations

The study protocol was approved by the University of Zambia Biomedical Research Ethics Committee. Consent was obtained after the interviewer explained the purpose of the study to the eligible participant. Entry forms were seen only by approved study personnel.

Results

A total of 1627 individuals participated in the survey, of which 42.3% were males. About half of the participants were within age range 25-34 years (56.0%), and 41.7% had attained secondary level of education. Overall, 24.7% (21.0% among male and 27.3% among female, p=0.005) participants were overweight, and 16.9% (8.0% among male and 23.5% among female, p<0.001) participants were obese. These results are presented in Table 1.

Factors associated with being overweight or obese are presented in Table 2. The factors that were associated with overweight or obese in bivariate analyses were: age, sex, education, eating vegetables, sedentary behaviour, smoking, and hypertension. However in a multivariate analysis, eating vegetables was no longer significantly associated with overweight or obese. Participants in the age groups 35-44 years were 29% (AOR=1.29, 95% CI [1.07, 1.55]) more likely to be overweight or obese compared to those aged less than 35 years. The female gender was positively associated with being overweight or obese (AOR=1.57, 95% CI [1.38, 1.78]). Compared to participants who had no formal education, participants who attained college or university level of education were 39% (AOR=1.39, 95% CI [1.10, 1.77]) more likely to be overweight or obese. Participants who spent 3.5 hours or more sitting or reclining on a typical day were 23% (AOR=1.23, 95% CI [1.05, 1.44]) more likely to be overweight or obese compared to those that spent less than 1.5 hours sitting or reclining. Non-smokers were 1.31 (95% CI [1.03, 1.66]) times more likely to be overweight or obese compared to smokers. Compared to participants who were hypertensive, participants who were not hypertensive were 30% (AOR=0.70, 95% CI [0.62, 0.80]) less likely to be overweight or obese.

Discussion

Our results have shown Kitwe's prevalence of overweight individuals (BMI 25–29.9 kg/m^2) to be 24.7% in the general population; 21.0% of men and 27.3% of women were overweight. The prevalence of obesity (BMI ≥ 30 kg/m^2) in the general population was 16.9%; 8.0% of men and 23.5% of women were obese. After controlling for selected confounding variables, being overweight or obese were found to be independently associated with the age of 35–44 years, female gender, completion of a college/university education, sedentary lifestyle of 3.5 hours per day, not smoking, and hypertension.

Rudatsikira et al, [23] reported on the prevalence of overweight and obese in Lusaka. The prevalence of overweight among males in Kitwe (21.0%) was higher than that of Lusaka of 15.5% but comparable among females (27.3% in Kitwe and 30.0% in Lusaka). Meanwhile, the prevalence of obesity among males in Kitwe (8.0%) was higher than that in Lusaka (5.1%). Similarly, the prevalence of obesity among females was higher in Kitwe (23.5%) than in Lusaka (18.6%). These differences may partly be due to the fact that Kitwe has experienced an economic boost due to mining reinvestments following a closure of mines that may have impacted more on the residents' standard of living in terms of consumption of high-energy foods and changes in residents' lifestyles than the impact of economic activities in Lusaka could have had on the residents of Lusaka.

The World Health Organization has presented factsheets [24] on the results of the STEPS surveys that countries have conducted. The prevalence of males in Kitwe (8.0%) who were obese is higher than those reported in the neighbouring countries: Malawi (2.0%), Mozambique (3.2%), Democratic Republic of Congo (DRC) in Kinshasa (3.9%), and Botswana (5.6%) but lower than that reported in Swaziland (13.6%). Meanwhile, our rate of obesity among females of 23.5% is lower than that reported in Swaziland (33.5%); comparable to that reported in Botswana (24.6%); and higher than those reported in Malawi (7.3%), Mozambique (10.8%) and DRC in Kinshasa (10.9%)

Upon comparing the prevalence of overweight among the neighbouring countries, the prevalence among males was higher in our study (21.0%) than in Malawi (16.1%), Mozambique (13.5%) and DRC (15.8%); comparable in Botswana (22.1%); and lower than that reported in Swaziland (38.2%). Among females, our prevalence of 27.3% is lower than those reported in Botswana (53.4%), DRC (31.8%), Mozambique (27.1%) and Swaziland (65.4%); and comparable to that reported in Malawi (28.1%).

Generally, the prevalence of obesity is higher in Zambia and its neighbouring countries than those reported in the horn of Africa: Eritrea (obesity 2.4% of males and 5.7% of females) and Ethiopia (obesity 2.0% of males and 10.6% of females). However, the prevalence of obesity in Kitwe [Zambia] and in neighbouring countries is comparable to those reported in West Africa: Mali (7.5% of males and 25.0% of females) and Chad (8.4% of males and 19.9% of females).

The differences in the prevalence of obesity and overweight in the above studies may reflect the economic developmental stages of the countries. The perception that being obese is a sign of a rich man and a sexually attractive woman [25] in sub-Saharan Africa may explain the differences in the prevalence of obesity between the horn of Africa and the sub-Saharan Africa regions. However, we are not sure of the similarities between the sub-Saharan Africa and West Africa regions in terms of genetics and perceptions.

Age has been seen as an associated factor for both male and female individuals' chances of becoming overweight or obese [26]. Those who were 35-44 years old were 29% more likely to be overweight or obese than were those aged less than 35 years.

The odds of being overweight or obese were higher in women than men. This result conforms to findings reported in other African countries [24]. The difference between women and men is probably biologically based and may relate to the fact that in general, women have a higher percentage of body fat than men and their resting fat metabolism is lower than in men [27, 28]. Another possible explanation is the sedentary lifestyles and lack of physical activity [29, 30] in women as compared to men. Another possible reason for women obtaining an obese shape is that women across the majority of the world's cultures had or have ideals of feminine beauty that include plumpness [31]. In other studies, Kumanyika et al [32] reported that about 40% of moderately and severely overweight Black-American women considered their figures to be attractive or very attractive; and Faber and Kruger [33] reported that only 2% of overweight and 30% of obese Black South African women thought that they were too fat. However, a narrow waist has been consistently described as beautiful in British, Indian and Chinese literature [34].

In terms of education, our results indicate that those who had completed college/university level of education were more likely to be overweight or obese than those with lower formal education. Higher educational status may result in changes in lifestyle, increased access to motorized transportation, increased rates of sedentary employment and sedentary lifestyles in general, and increased ability to eat fast food. The association between higher education level and overweight or obesity in our study has also been documented elsewhere [9, 35, 36]. However, inverse associations between education and obesity have been found in other parts of the world as well [37, 38]. Persons with higher education status may be well informed to change their lifestyles to live healthy lives.

Strengths and limitations

The strength of this study lies in the fact that it involved a large sample size. Anthropometric measurements were made by health professionals who were also trained for the study. The use of the STEPs method could also make our findings more likely to be compared with other studies. We believe our results can be generalized to adults aged 25 years or older in Kitwe. However our study had some limitations that may make our results not to be generalized to the whole population. The study did not have information on the number of household members of age of 25 years or older making it difficult for us to compute the response rates. We therefore could not compute weights that could have been used in the analysis. Our results may be biased to the extent that the non-responses differed from those that participated in the study. We are however unable to suggest the direction of the bias.

Conclusions

Our results indicate the need to have intensive and comprehensive public health interventions to reduce the prevalence of overweight and obesity in Kitwe, especially in women. The lessons learnt in Kitwe can be scaled-up to the rest of the country. Health living should be promoted in terms of consumption of fruits and vegetables, regular exercises, reduction of calorie dense foods. There is a need to have concerted efforts to reduce overweight and obesity. This may reduce the prevalence of non-communicable diseases such as cardiovascular disorders.

Competing interests

The authors declare that they have no competing interests.

Authors' contributions

CZ led the drafting of the manuscript and participated in the interpretation of the results. OB, PS, ASM, ER and VMM participated in the interpretation of the results and drafting of the manuscript. SS participated in the design of the study, supervision of the research assistants during data collection and entry, analysis of data, interpretation of results and drafting of the manuscript. All authors read and approved the final manuscript.

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