Obesity and associated factors among adults attending medical clinic at ndola central hospital in Zambia

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ABSTRACT

Background and Purpose: It has been demonstrated that obesity is a condition which is associated with a number of factors andstudies show that individuals who are overweight or obese run a greater risk of developing diabetes mellitus, hypertension, coronary heart disease, stroke, arthritis, and some forms of cancer. The objective of this study was to identify the factors that are associated with obesity among adults at Ndola Central Hospital (NCH), Zambia.**Methods:** All clients aged18 years and above who were coming for medical clinic at NCH in a period of 2 months (01/01/2016 to 28/022016.) were captured in the study. A case control study was conducted. Structured questionnaire was used to collect data and anthropometric measurements were done. Data entry and analysis were conducted using Epi Data version 3.1 and SPSS version 16.0, respectively. The Pearson's Chi-square and the Fisher's exact tests were used to establish associations. The cut off point for statistical significance was set at the 5% level. **Results:** A total of 80 individuals participated in this study. In this population 40 were obese and 40 had normal BMI. Among the obese, 26(65.0%) were aged 40+, while those who had normal BMI 22(55.0%) were <40 years old. It was also found that of the obese patients 32(80.0%) were females and only 8(20.0%) were males, while in the normal population 23(57.5%) were male and 17(42.5%) were female [Table2]. 26(81.2%) of obese patients who had their blood pressure measured were hypertensive (blood pressure ≥140/90 mmHg while only 9(27.3%) of the normal population were hypertensive. It was noticed that the majority 27(67.5%) of obese patients either did less than moderate exercise or no exercise at all, while the majority 23(57.5%) in normal population did exercise. Results also showed that 10(25%) of obese population used vegetable oil while 30(75.0%) used non vegetable oil.**Conclusions:** In conclusion, it was found that Hypertension was independently associated with obesity among adults attending medical clinic at NCH, other factors which were associated with obesity were Exercise, Type of cooking oil used and sex.

Key words: BMI, Factors, Hypertension, Obesity, Zambia.

Introduction

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy and/or increased health problems [1]. The human body naturally stores fat tissue under the skin and around organs and joints. Fat is critical for good health because it is a source of energy when the body lacks the energy necessary to sustain life processes, and it provides insulation and protection for internal organs. But the accumulation of too much fat in the body is associated with a variety of health problems [7]. Obesity increases the likelihood of various diseases, particularly heart disease, hypertension, type 2 diabetes, obstructive sleep apnoea, certain types of cancer, and osteoarthritis, these conditions not only lead to reduced quality of life given their protracted nature, they also lead to premature death. Apart from that, obesity is also associated with poorer mental health outcomes and reduced quality of health [2]. Obesity affects approximately 1.70 billion people worldwide and over 135 million people in Europe [3]. It is for these reasons that obesity has become a major health issue for public discourse in most developed western countries. Over the past

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several decades, the prevalence of obesity has been increasing both in developed and developing countries, and more noticeably in urban areas [10]. It is currently estimated that as much as 20-50% of urban populations in Africa are classified as either overweight or obese [5] [6] and that by 2025 three quarters of the obese population worldwide will be in non-industrialized countries [2]. Africa is undergoing nutrition transition that is characterized by coexistence of malnutrition and obesity, with the obesity epidemic affecting first the wealthier populations and later strongly associated with poverty [9]. It has been argued that this epidemic has occurred because of the increasing affordability of highly refined oils and carbohydrates, and a move away from subsistence farm work to sedentary lifestyles. A lot of data has been collected to find the prevalence and associated factors of obesity and it has been found that obesity is not just a cosmetic consideration but it is a chronic medical disease that can lead to diabetes, high blood pressure, heart disease, gallstones, and other chronic illnesses throughout the world. One of the surprising things about obesity is that it is culturally and socially acceptable among Zambians and therefore is not usually recognized as a medical problem. In Zambia, obese patients frequently present to the general duty clinicians. The failure to diagnose obesity and obesity-related morbidities by clinicians leads to missed opportunities to counsel obese patients on lifestyle modification and also to screen them for obesity-related morbidities. The enormous and rising burden of obesity and its medical consequences in developing countries such as Zambia has informed the decision for this study. The early recognition of obesity by clinicians working in hospitals such as Ndola central hospital is quintessential to its management, while identifying its common primary comorbidities avails great opportunities for prevention and control. The principal aim of this study was to identify the factors associated with obesity in adult patients attending medical clinic at Ndola central hospital.

Materials and methods

Study site

The study was conducted at the Medical clinic of Ndola Central Hospital (NCH). NCH is a government Hospital in Ndola town of the Copperbelt Province, located along Nkana Road.

Study design

This was a case control study carried out from January 2016 to February, 2016.

Study population

Patients aged 18 years and above who were willing to give consent were eligible for inclusion into the study. Ages 18 and above are old enough to provide the required information.

Sampling and Sample size

A total of 80 consecutive new adult patients aged 18-80 years were screened for obesity (BMI $\geq 30 Kg/m^2$). 40 patients who had BMI $\geq 30 Kg/m^2$ and 40 patients with BMI between 18.5 and $24.9 Kg/m^2$ met the inclusion criteria, therefore, were recruited for the study at the General Outpatient Clinic of NCH. Pregnant women, patients who had as cites and other forms of edema and patients who had physical deformities affecting the spine and/or the limbs and critically ill patients who could not stand for height and weight measurement were excluded from the study.

Sample size estimation was determined using the formula below [10]. The calculation was as follows. And the minimum sample size was determined by taking 60 patients in a pilot study of which 30 were obese and the other 30 were normal.

$$\boldsymbol{n = \frac{P1\,(100 - P1) + P2(100 - P2)}{(P1 - P2)} \times f(\alpha, \beta)}$$

Where $\boldsymbol{n = sample\ size}$

$\boldsymbol{P1 = likely\ \%\ in\ normal\ population,}$ $\boldsymbol{P2 = likely\ \%\ in\ obese, f(\alpha, \beta) = 7.85}$

From the pilot study which was conducted, the following parameters were used to determine P1 and P2 these included sex, fatty non vegetable oil and hypertension.

The following table shows the out comes

Factor	% Normal population (P1)	% in obese population (P2)	N
Female sex	40%	83%	16
Non vegetable oil	3%	23%	40
hypertension	27%	57%	38

Calculation of sample size was as follows

$$n = \frac{P1\ (100 - P1) + P2(100 - P2)}{(P1 - P2)^2} \times f(\alpha, \beta)$$

Taking sex as a determining parameter:
When P1= 40%, P2=83% then:

$$n = \frac{40\ (100 - 40) + 83(100 - 83)}{(40 - 83)^2} \times 7.85$$

$$\underline{n = 16}$$

Taking fatty oil as a determining parameter
When P1=3%, P2=23

$$n = \frac{P1\ (100 - P1) + P2(100 - P2)}{(P1 - P2)} \times f(\alpha, \beta)$$

$$n = \frac{3\ (100 - 3) + 23(100 - 23)}{(3 - 23)^2} \times 7.85$$

$$\underline{\boldsymbol{n = 40}}$$

Taking hypertension as a determining parameter:
When P1= 27%, P2= 57%

$$n = \frac{P1\ (100 - P1) + P2(100 - P2)}{(P1 - P2)} \times f(\alpha, \beta)$$

$$n = \frac{27\ (100 - 57) + 57(100 - 57)}{(27 - 57)} \times 7.85$$

$$\underline{n = 38}$$

From the above parameters "n" was taken to be 40, therefore, from each population 40 patients were included in the study to make total sample size of 80.

Data collection

The data collection was done in January to February 2016. Collection of data needed some few assistants of which 3rd years nursing students who were knowledgeable and trained on how to carry out the height, weight and blood pressure were involved and also in administering the questionnaire. Participants were coming to the medical clinic for reviews and data was collected from there. The clinic runs during working hours from Tuesday to Friday, including public holidays. A pretested structured questionnaire was administered to obtain sociodemographic characteristics which included age, sex, education, smoking, alcohol intake type of diet, exercise, blood pressure and history of diabetes mellitus etc and Anthropometric data was measured by standard methods. The body mass index (BMI) was calculated and in conjunction with waist circumference (WC) was used as measures of obesity.

Height

Height was measured using the seca 2014 portable stadiometer (secagmbh&co.kg, German). While the measurement, participants were requested to remove foot wear or head gear, have feet together, heels against the back board, knees straight, and look straight ahead. Height was recorded in meters.

Weight

Weight was measured using the QF-2003B portable professional adult scale. Participants were asked to stand still, face forward, and place arms on the sides of the body feet in their minimal clothing and with their pockets free of objects that might add to their weights such as mobile phones, wallets, keys, rings, etc. Weight was recorded in kilograms (kg).

Body Mass Index

The BMI of $\geq 30 Kg/m^2$ was taken as the operational definition of obesity [14], with the following categorization: Class I obesity (mild obesity) = BMI of 30-34.9, class II obesity (moderate obesity) = BMI of 35-39.9 and class III obesity (severe obesity) = BMI of ≥ 40.

The Blood pressure

Blood pressure was measured three times using the digital sphygmanometer. Participant rested for three

minutes in between taking the measurements. An average of three reading was considered as the blood pressure for the participant. The blood pressure was measured using the auscultatory method with standard mercury in glass Accuson sphygmomanometer. Prior to the measurement, the patient was seated and rested for 5 min, in a sitting position on a chair that supported the back comfortably. The left arm muscles were relaxed and the forearm was supported with the cubital fossa at the heart level. A cuff of suitable size was applied evenly to the exposed arm. The cuff was rapidly inflated until the manometer reading was about 30 mmHg above the level at which the pulse disappeared and then slowly deflected. During this time, the Korotkoff sounds were monitored using a Litman stethoscope placed over the brachial artery. The systolic blood pressure was noted at the pressure at which the first heart sounds were heard (Korotkoff phase I). The diastolic blood pressure was taken as the pressure at the point when the heart sounds disappeared (Korotkoff phase V). The blood pressure was also measured in the right arm as described for the left arm in order to rule out a significant interarm blood pressure difference, and the arm that gave the higher reading was subsequently used [13]. The systolic and diastolic blood pressures were measured twice separated by an interval of 2 min [13]. The three readings were recorded and the mean value was calculated. Hypertension is defined [13] as systolic and/or diastolic blood pressures ≥140/90 mmHg.

Diabetes mellitus

Diabetes mellitus was defined[12]by venous plasma fasting blood sugar ≥126 mg/dl (7.0 mmol/l) after an overnight fast, however this was not done but information was based on the history and current medical status of the patient.

Data entry and analysis

Data entry and analysis were conducted using Epi Data version 3.1 and SPSS version 16.0, respectively. The Pearson's uncorrected Chi-square and the Fisher's exact tests (two tailed p-value) were used to establish associations. The cut off point for statistical significance was set at the 5% level.

Data Analysis

The analysis included running cross-tabulations, and multivariate logistic regression. A backward variable selection method in logistic regression was used to determine independent predictors for obesity. Unadjusted odds ratios (OR) and their 95% confidence interval (CI), and adjusted odds ratios (AOR) and their 95%CI are presented. Body mass Index (BMI) was categorized as 18.5-24.9 kg/m2 (normal) and 30+ kg/m2 (obese); A participant with blood pressure of more than 140/90 mmHg was classified as being hypertensive.

Ethical consideration

Ethical clearance was sought from the ethics committee Tropic Disease Research Centre (TDRC) before commencement of the project. Permission to conduct the study was given by the hospital administration through the office of head clinical care Ndola Central Hospital under the department of medicine. The targeted subjects had a right to refuse participation. Interviews were conducted in the medical clinic and waist measurement was done in privacy.

Results

Forty (50%) out of a total of eighty (100%) new adult patients screened were obese (i. e., had BMI of $\geq 30 Kg/m^2$). Of the 40 patients who were obese, 30(75%) had class I obesity (i. e., BMI 30-34.9), 8 (20%) had class II obesity (i. e. BMI 35-39.9) and 2(5%) had class III obesity (BMI ≥ 40) [Table 1]. The age of the patients involved in the survey ranged from 18 to 90 years, with a mean age of 44.5 years. On the population of obese patients the majority 26(65.0%) were aged 40+, while those who were not obese the majority 22(55.0%) were <40 years old. It was also found that of the obese patients 32(80.0%) were females and only 8(20.0%) were males, while in the normal population 23(57.5%) were male and 17(42.5%) were female [Table2]. The majority of obese patients 21(52.5%) did not reach secondary school, only 19(47.5%) reached secondary level of education. However, this was not so among patient with normal BMI whose results were as shown in the [Table 3]. 26(81.2%) of obese patients who had their blood pressure measured were hypertensive (blood pressure ≥140/90 mmHg while only 9(27.3%) of the normal population were hypertensive. It was noted that 27 patients who had their blood sugar checked had diabetes. Among the obese patients 18(60.0%) were diabetic while 12(40.0%) were not and among those with normal BMI, 9(52.9%) were diabetic while 8(47.1%) were not [Table3]. It was noticed that the majority 27(67.5%) of obese patients either did less than moderate exercise or no exercise at all, while the majority 23(57.5%) in normal population did exercise.

Results also showed that 10(25.5%) of the obese population used vegetable oil while 30(75.0%) used non vegetable oil. Participant who are hypertensive were 3.40(95% CI [1.89,6.11]) × more likely to be obese compared to participant who were not hypertensive.

Table 1: Prevalence of obesity (BMI ≥ 30 kg/m2) and BMI categories of obese patients

Prevalence	
Status	**Number (%)**
BMI ≥ 30 kg/m2	40 (50.0)
BMI < 30 kg/m2	40 (50.0)
Total	80 (100.0)
BMI≥ 30 kg/m2categories	
Class I obesity (BMI 30-34.9)	30(75.0)
Class II obesity (BMI 35–39.9)	8(20.0)
Class III obesity (BMI ≥ 40)	2(5.0)

Table 2: Demographic characteristics of the obese patients

Factor	Obese population n (%)	Non obese population n (%)	p-value
Age (years)			
<40	14(35)	22(55.0)	0.072
40+	26(65)	18(45.0)	
Total	40(100)	40(100.0)	
Gender			
Male	8(20)	23(57.5)	0.001
Female	32(80)	17(42.5)	
Total	40(100)	40(100)	
Education			
<secondary	21(52.5)	17(42.5)	0.370
Secondary+	19(47.5)	23(57.5)	
Total	40(100)	40(100)	

Table 3: Primary co-morbidities of the obese patients

Factor	Obese population n (%)	Normal population n (%)	p-value
Hypertension (SBP/DBP ≥ 140/90 mmHg)			
Yes	26(81.2)	9(27.3)	<0.001
No	6(18.8)	24(72.7)	
Total	32(100)	33(100)	
Diabetes mellitus			
Diabetic	18(60.0)	9(52.9)	0.638
Non-diabetic	12(40.0)	8(47.1)	
Total	30(100)	17(100)	

Table 4: other behavioral characteristics of the obese patients

Factor	Obesity population n (%)	Normal population n (%)	p-value
Smoking			
Yes	7(17.5)	2(5.0)	0.154*
No	33(82.5)	38(95.0)	
Total	40(100)	40(100)	

Alcohol			
Yes	13(32.5)	8(20.0)	0.204
No	27(67.5)	32(80.0)	
Total	40(100)	40(100)	
Quantity on those who take alcohol			
<5 units	4(26.7)	2(25.0)	1.000*
5+ units	11(73.3)	6(75.0)	
Total	15(100)	8(100)	
Exercise			
Moderate+	13(32.5)	23(57.5)	0.025
<moderate	27(67.5)	17(42.5)	
Total	40(100)	40(100)	
Type of cooking oil used			
Vegetable oil	10(25.0)	26(65)	<0.001
Non vegetable	30(75.0)	14(35)	
Total	40(100)	40(100)	
Vegetables			
Everyday	35(87.5)	35(87.5)	1.000
Not everyday	5(12.5)	5(12.5)	
Total	40(100)	40(100)	
Fruits			
Everyday	3(7.5)	6(15.0)	0.481*
Not everyday	37(93.5)	34(85.0)	
Total	40(100)	40(100)	

Note: (*) represent P-value calculated from Fishers Exact Test

Discussion

In a facility study of obesity among adults attending medical clinic at Ndola Central Hospital in Zambia, 75% of obese patients belonged to Class I obesity defined as BMI 30-34.9 and out of the 40 obese patients admitted to the study, 32 (80.0%) were females and only 8 (20.0%) were males. In the bivariate analysis gender, exercise, cooking oil used and hypertension were positively associated with obesity. Gender was significantly associated with obesity in our current study and this is in accord with the findings by Rudatsikira et al. 2012 in capital city of Zambia, Lusaka which indicate that Zambian women are more at risk of being obese than men. Besa and colleagues [Besa et al, 2013] in a study to determine the prevalence and correlates of overweight and obesity in Kaoma and Kasama noticed that obesity was associated with gender even in the rural districts of Zambia. With regard to the factors that were assessed if they were associated with being obese, the current study found an association between being obese and hypertension. This finding agrees with a study in rural Zambia by [Besa et al. 2013] which linked hypertension with obesity. Gomes et al [21] also reported that obesity was positively associated with hypertension. In Cameroon, Shey Wiysonge et al [22] also found a significant association between obesity and hypertension. The study in Egypt by El-Shafei et al [23] found that elevated BMI was significantly associated with an increased risk of essential hypertension. In Uganda, hypertension was found to be associated with high BMI and other factors [24,25].The current study found that exercise and type of cooking oil used were significantly associated with obesity. Majority of participants with a normal BMI exercised and used vegetable oils. This is in agreement with other studies [16, 17, 18, 19, 20] which show that exercise and type of cooking oil used are associated with obesity. However, it is imperative that we also consider factors that were found to be associated with obesity in other studies within the region so that when measures are put in place to deal with this problem of obesity in Zambia, such factors can be covered as well.

Conclusion

In conclusion, it was found that Hypertension was independently associated with obesity among adults attending medical clinic at NCH, other factors which were associated with obesity were Exercise, Type of cooking oil used and sex. Therefore, a comprehensive public health approach to combat the increasing prevalence of obesity and its consequences should also put into consideration all these factors.

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