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Original Article

Prevalence and factors associated with obesity and overweight among nurses in Mulago National Referral Hospital: A cross-sectional study.

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ABSTRACT

Background:

Obesity and overweight are major risk factors for cardiovascular disease and are increasingly affecting healthcare workers. This study determined the prevalence of obesity and overweight and associated factors among nurses at Mulago National Referral Hospital, Uganda.

Methods:

It was a cross-sectional design. Nurses of different cadres working at Mulago hospital who were present were studied. All nurses were contacted, and those who consented were recruited. Data was collected using a modified WHO-STEPPS tool. All nurses were sampled, and those who consented were included in the study. Data was entered into EpiData v4.6 and analysed using STATA 14. Categorical data were summarized as frequencies and percentages. The prevalence of obesity and overweight was estimated as a proportion of the entire sample size. An analysis of factors associated was done by modified Poisson regression reporting robust standard errors. Ethical approval was sought from MakSOMREC.

Results:

A total of 173 nurses participated, of whom 71.1% were female. The prevalence of overweight was 36.9%, while obesity was 33.5%. Overall, 70.5% of nurses were either overweight or obese. Abdominal obesity was 61.8% using waist circumference and 36.9% using waist-to-hip ratio. Female sex (adjusted PR=0.84, 95%CI 0.76–0.93) and having one job (adjusted PR=0.84, 95%CI 0.72–0.97) were independently associated with obesity and overweight.

Conclusions:

Obesity and overweight are high among nurses in Mulago hospital, with the female gender more at risk.

Recommendations:

Workplace wellness programmes promoting healthy nutrition, physical activity, and regular obesity screening should be implemented among nurses.

Keywords: Obesity; Overweight; Nurses; Body Mass Index; Uganda

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Introduction

More than half a billion people in the world's population are obese or overweight (1). Worldwide, obesity and overweight lead to morbidity of about 2 billion people and death of about 2.8 million people, and it is considered the fifth leading cause of disease (2). There is an observed faster growth of obesity and overweight in developing countries, and Uganda is not an exception. A Ugandan nationwide

health and demographic survey showed a significant rise in the prevalence of overweight [9.77% vs 16.21%] and obesity [1.99% vs 6.21%] in the general population between 1995 and 2016, respectively (3). Prevention strategies for obesity and overweight and other cardiovascular diseases (CVDs) risk factors include, among other things, identifying high-risk groups and directing interventions towards them (4). Nurses have been identified as one of the high-risk



groups for overweight and obesity (5). Nurses, due to the nature of their job, are prone to a high level of stress, burnout, lack of physical exercise, and sleeping and eating disorders. This leads to various health complications, including obesity and overweight (6). Nurses have unfavorable working schedules (7) with long working hours, on-call/overtime, and night shifts. The workload among Ugandan nurses is very high, with a nurse-to-patient ratio of over 1:11,000 (8). Nurses on night shifts are more likely to eat more snacks than to eat a complete meal. There is also a craving for sugar and high-carbohydrate food on the day following a night shift due to feelings of extreme fatigue. Nurses act as a practical model of healthy life for both patients and the community. Therefore, the health of nurses is critical, of great concern, and should not be overlooked (9). However, the prevalence of obesity among Ugandan nurses is not known. degradation of the quality and quantity of work, hence leading to a reduction in nurses. In addition to their direct and indirect costs involved in the management of the outcomes of obesity and overweight, they also lead to problems at work, such as absenteeism, loss of working time, leaving the service, or deciding to change jobs, reduction in the beneficial service duration of nurses, and performance. Hence, there was a need to study obesity and overweight and associated factors among this important group of high-risk professionals in Uganda.

Methods

Study design and setting

A hospital-based cross-sectional study was conducted between **June and August 2022** at Mulago National Referral Hospital (MNRH) in Kampala, Uganda. MNRH is the country's largest public national referral and teaching hospital with over 1,700 beds. It provides specialized tertiary healthcare services including internal medicine, surgery, obstetrics and gynaecology, paediatrics, intensive care, oncology, emergency medicine, trauma care, and several super-specialty services. The hospital also serves as the principal teaching hospital for Makerere University College of Health Sciences. It has nurses of all cadres, from enrolled, registered, and graduate nurses of different ages, performing a range of roles, and from different parts of the country.

Participants

Eligible participants were enrolled, registered, and graduate nurses employed at Mulago National Referral Hospital who were on duty during the study period and provided written

informed consent. Pregnant nurses were excluded because pregnancy alters anthropometric measurements used to define obesity.

A complete list of nurses was obtained from the nursing administration. A total of 278 nurses who were on duty during the time of data collection were approached for consent. Of these, 173 consented and were enrolled in the study. 102 nurses declined consent, while 3 were excluded because they were pregnant.

The sample size was estimated using the Kish-Leslie formula based on a prevalence of 30.3%(10) at 95% level of confidence and a 5% tolerable sampling error, which yielded 325 participants. After finite population correction and adjustment for non-response, 206 nurses were targeted. A total of 173 were enrolled.

Data collection procedure

Data was collected in 2 phases using the WHO STEPS questionnaire; The WHO STEPS questionnaire is a tool used to collect data and measure the NCD risk factors. It has the core and expanded options. I will use the core option. 1. The first part included an interviewer-administered questionnaire regarding the demographic characteristics, history of alcohol consumption, diet, regular exercise, and number of working hours. 2. The second part included anthropometric measurements: weight(kgs), height (mtrs), waist circumference (cms), hip circumference (cms). The ASCO 2000 brand of weighing scale was used to measure weight, and the SECA brand stadiometer was used for height. A tape measure was used to measure waist and hip circumferences. Diet was measured by part of the STEPS questionnaire by asking questions about the consumption of fruits and vegetables. Physical activity was also assessed using a part of the STEPS questionnaire by asking questions about exercise. Basal metabolic index (BMI) was calculated as weight divided by the square of height (meters squared). Overweight was defined according to the WHO criteria as a BMI of 25.0–29.9kg/m², and obesity as a BMI of 30.0kg/m² or above. Abdominal obesity was defined as a waist circumference (WC) ≥ 94 cm for men and ≥ 80 cm for women or a waist-to-hip ratio (WHR) ≥ 0.90 in men and ≥ 0.85 in women (11, 12). 2 graduate nurses and the principal investigator collected the data. They were first trained in anthropometric measurements. The participants were found at their work stations, and data was collected there and then for those who consented. Data collection was done on any day of the week and in all three shifts (morning, evening, and night).



Data management and analysis

Data was entered and stored in EPIDATA version 4.6 software. Categorical data were summarized as frequencies and percentages and presented in tables and stratified by the sex of the participants. Numerical data were summarized as means or medians. The prevalence of obesity and overweight was estimated using cross-table analysis for factors associated with it, using modified Poisson regression reporting robust standard errors. Factors with a p-value less than 0.2 at bivariate analysis were selected for multivariate analysis. In multivariate analysis, variables with a p-value 10%. Confounders were included in the model, whether they are significant or not. The final model reported prevalence ratios with robust standard errors and confidence intervals.

Bias

Several measures were implemented to minimise bias. Standardized WHO STEPS questionnaires and calibrated anthropometric equipment were used to reduce measurement bias. Research assistants received training on data collection procedures and anthropometric measurements before study commencement. Data was collected during morning, evening, and night shifts to reduce

selection bias associated with work schedules. Multivariable modified Poisson regression was used to adjust for potential confounding factors.

Ethical consideration

Clearance was sought from the Clinical Epidemiology unit of Makerere University. Ethics approval was obtained from Makerere University School of Medicine Research Ethics Committee (SOMREC) on 21/11/2021 with ethical clearance No. 3-2021-11-03. Permission was sought from the Mulago hospital administration.

Written informed consent was obtained from all participants before their enrolment into the study. Before requesting consent, each eligible nurse was provided with detailed information about the study, including its purpose, objectives, procedures involved, expected duration, potential risks and benefits, and the intended use of the findings. Participants were given sufficient time to read the participant information sheet, ask questions, and seek clarification before deciding on participation. Participants could withdraw at any stage without any consequences.

Results

Study profile

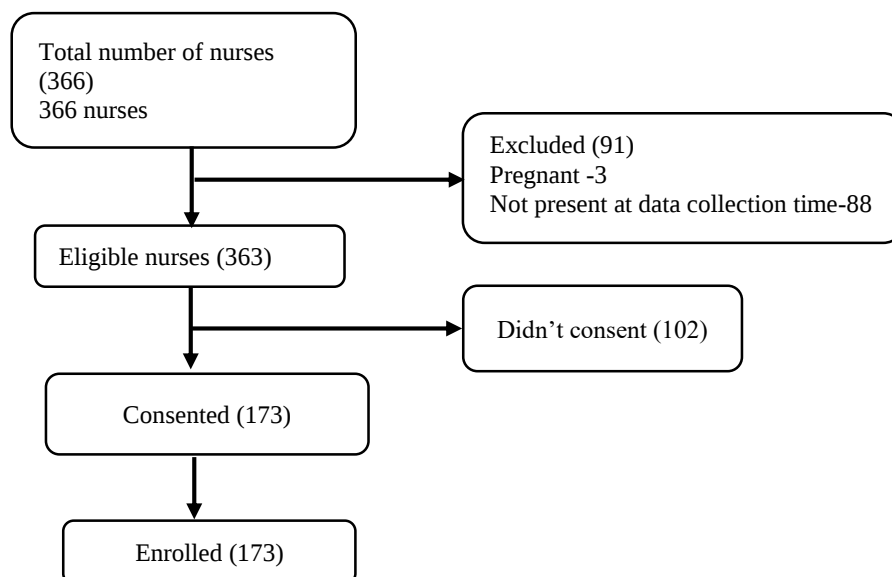


Figure 1: Study profile



Demographic characteristics of participants

A total of 173 nurses were recruited for the study. Of these 50(28.9%) were males and 123(71.1%) females. The mean age of these nurses was 37.5+/-8.3 years, ranging from 24 to 58 years. However, the mean age for male nurses was 33.0+/-5.6 while that for females was 39.5+/-8.5 years, as shown in Table 1

Page | 4 **Table 1: Demographic characteristics of the 173 nurses recruited from Mulago hospital by sex.**

Variable	Category	Male (%) n=50	Female (%) n=123	Total (%)	p-value
Age	20-29	11(22.0)	18(14.5)	29(16.8)	0.001
	30-44	38(76.0)	70(56.9)	108(62.4)	
	45-59	1(2.0)	35(28.5)	36(20.8)	
Cadre	Enrolled	6(12.0)	15(12.2)	21(12.1)	0.562
	Registered	29(58.0)	61(49.6)	90(52.0)	
	Graduate	15(30.0)	47(38.2)	62(35.9)	
Education	Certificate	4(8.0)	12(9.8)	16(9.3)	0.280
	Diploma	30(60.0)	58(47.2)	88(50.9)	
	Degree	13(26.0)	49(39.8)	62(35.8)	
Marital	Masters	3(6.0)	4(3.2)	7(4.1)	0.128
	Single	8(16.0)	9(7.3)	17(9.8)	
	Married	41(82.0)	102(82.9)	143(82.7)	
Income	Divorced	1(2.0)	9(7.3)	10(5.8)	0.066
	Widowed	0(0.0)	3(2.5)	3(1.7)	
	<500k	4(8.0)	11(8.9)	15(8.7)	
Working hours	500k-1M	28(56.0)	52(42.3)	80(46.3)	0.002
	1M-2M	10(20.0)	49(39.9)	59(34.1)	
	Above 2M	8(16.0)	11(8.9)	19(10.9)	
Jobs	6-8hrs	18(36.0)	82(66.7)	100(57.8)	0.73
	9-11hrs	10(20.0)	18(14.6)	28(16.2)	
	12-16hrs	22(44.0)	23(18.7)	45(26.0)	
Jobs	1	43(86.0)	110(89.3)	154(88.4)	0.73
	2	6(12.0)	12(9.9)	18(10.5)	
	3	1(2.0)	1(0.8)	2(1.1)	

Behavioral characteristics of participants

Concerning alcohol consumption, a total of 110 (63.6%) nurses were 'never drinkers' while only 24(13.9%) were current drinkers. Mean servings of fruit were 1.6 servings (handfuls) per day, while mean servings of vegetables per day were 1.4 servings (handfuls). Mean combined fruit and vegetable servings were 3.0 per day. Of all the participants,

90.9% had less than 5 combined servings of fruits and vegetables. Only 28.5% and 24.4% of the females did leisure-time vigorous and moderate physical activities, respectively. The average time for travel to and from places while walking or bicycling was 308 minutes per week. 35.3% did not walk or cycle for more than 150 minutes per week. Details are shown in Table 2 below.

Table 2: Behavioral characteristics of 173 nurses recruited from Mulago hospital

Variable	category	Male	Female	Total	p-value
Alcohol consumption	Current drinkers	14(28.0)	10(8.1)	24(13.9)	0.001
	Drank in the last 12 months	20(40.0)	24(19.5)	44(25.4)	0.002
	Never drinkers	29(58.0)	81(65.9)	110(63.6)	0.330
Fruit & veg servings	< 5 servings/day	45(90.0)	111(90.9)	156(90.7)	0.828
	>=5 servings/day	5(10.0)	11(9.1)	16(9.3)	
Leisure-time vigorous activity	Yes	22(44.0)	35(28.5)	57(32.9)	0.144
	No	28(56.0)	88(71.5)	116(67.1)	
Leisure time moderate activity	Yes	24(48.0)	30(24.4)	54(31.2)	0.002
	No	26(52.0)	93(75.6)	119(68.8)	
Work-related vigorous activity	Yes	15(30.0)	27(21.9)	42(24.3)	0.263
	No	35(70.0)	96(78.1)	131(75.7)	
Work-related moderate activity	Yes	24(48.0)	56(45.5)	80(46.2)	0.768
	No	26(52.0)	67(54.5)	93(53.8)	
Travel (walking & cycling)	<150mins/week	13(26.0)	48(39.0)	61(35.3)	0.104
	>=150mins/week	37(74.0)	75(61.0)	112(64.7)	

Prevalence of obesity and overweight

Overall mean WC was 89.4 (+-11.9) cm, while that for males was 85.2(+8.9) cm, and that for females was 91.2(+12.6) cm. The mean waist-to-hip ratio was 0.8+-0.06 as shown in Table 3 below.

Table 3: Prevalence of Obesity and overweight of 173 nurses from Mulago hospital stratified by sex

Variable	Category	Male	Female	Total	p-value
BMI	Underweight	0(0.0)	0(0.0)	0(0.0)	
	Normal	26(52.0)	25(20.3)	51(29.5)	<0.001
	Overweight	21(42.0)	43(34.9)	64(36.9)	
	Obese	3(6.0)	55(44.7)	58(33.5)	
WC	Normal	41(82.0)	25(20.0)	66(38.2)	0.721
	Abnormal	9(18.0)	98(80.0)	107(61.8)	
WHR	Normal	34(68.0)	75(60.0)	109(63.1)	0.605
	Obese	16(32.0)	48(39.0)	64(36.9)	
BMI (combined obesity + overweight)	Normal	26(52.0)	25(20.3)	51(29.5)	<0.001
	Combined	24(48.0)	98(79.7)	122(70.5)	

Factors associated with overweight and obesity

Variables with a p-value<0.2 were considered significant at bivariate analysis. Sex, age, working hours, number of jobs, vigorous work, moderate leisure time, cadre, education level, and moderate leisure time activity were significant in the bivariate analysis, as shown in Table 4.



Table 4: Bivariate analysis of factors associated with obesity and overweight among 173 nurses in Mulago hospital.

Variable		Obese/overweight(fat No;n(n%))	Yes:n(n%)	PR	CI	p-value
Sex	Male	24(48.0)	26(52.0)	1		
	Female	98(79.7)	25(20.3)	1.39	0.25-0.61	<0.01
Age		NA	NA	0.95	0.92-0.99	0.01
Marital	Single	10(58.8)	7(41.2)	1.46	0.77-2.69	0.26
	Married	102(71.3)	41(28.7)	1		
	Divorced	7(70.0)	3(30.0)	1.05	0.39-2.79	0.01
	Widowed	3(100.0)	0(0.0)	0.01	0.01-0.02	<0.01
Working hours		NA	NA	1.09	0.99-1.19	0.09
No. of Jobs	1	112(73.7)	40(26.3)	1		
	2	8(44.4)	10(55.6)	2.11	1.29-3.46	0.01
	3	1(50.0)	1(50.0)	1.90	0.46-7.82	0.37
Vigorous work	Yes	25(59.5)	17(40.5)	1		
	No	97(74.1)	34(25.9)	0.64	0.40-1.02	0.06
Cadre	Enrolled	17(80.9)	4(19.1)	0.50	0.20-1.29	0.15
	Registered	56(62.2)	43(37.8)	1		
	Graduate	49(79.0)	13(21.0)	0.56	0.32-0.96	0.04
Educ	Certificate	13(81.3)	3(18.7)	0.50	0.17-1.45	0.19
	Diploma	55(62.5)	33(37.5)	1		
	Degree	48(77.4)	14(22.6)	0.60	0.17-1.44	0.06
	Masters	6(85.7)	1(14.3)	0.38	0.06-2.39	0.30
Income	<500k	11(73.3)	4(26.7)	0.82	0.34-2.02	0.67
	500k-1M	54(67.5)	26(32.5)	1		
	1M-2M	47(79.7)	12(20.3)	0.63	0.34-1.14	0.12
	Above 2M	10(52.6)	9(47.4)	1.46	0.82-2.58	0.19
Alcohol	Yes	42(66.7)	21(33.3)	0.22	0.77-1.95	0.39
	No	80(72.7)	30(27.3)	1		
Work-related moderate activity		NA	NA	1.05	0.66-1.67	0.85
Leisure time Vigorous activity		NA	NA	1.10	0.95-1.28	0.20
Servings (fruit+ vgs)<5servings		109(69.4)	48(30.6)	1		
	>servings	13(81.3)	3(18.8)	1.04	0.93-1.17	0.51
Moderate leisure time activity	Yes	31(57.4)	23(42.6)	1.81	1.15-2.84	0.01
	No	91(76.5)	28(23.53)	1		

In the multivariate analysis, sex and having one job were significant factors, while moderate leisure time was a confounder to the number of jobs, as shown in Table 5 below.



Table 5 Multivariate analysis of factors associated with obesity/overisty(fat) among 173 nurses

Variable		PR	CI	p-value
Sex	Male	0.84	0.76-0.93	0.01
No. of Jobs	2	0.84	0.72-0.97	0.03
	3	0.87	0.72-1.24	0.19
Moderate leisure activity		0.92	0.84-1.01	0.09

Discussion

Prevalence of obesity and overweight

Overall prevalence of abnormal BMI (obesity and overweight) was at 70.5%, with 79.7% being female. 36.9% (32.8% male and 77.2% female) of the nurses were overweight, and 33.5% obese, of which 94.8% were females. This prevalence is comparatively greatly higher than that of the general Ugandan population of 16.2% and 6.2% for overweight and obesity, respectively (13). This may be because of the higher age of most nurses in the study group, given that 53% of the participants were above 35 years of age. It may also be explained by a possibly higher socio-economic status in the study population compared to the average Ugandan population, a sedentary kind of lifestyle both at work and at home due to lack of physical exercise, or perhaps because the study population was largely female-dominated, as these characteristics have been known to be associated with overweight and obesity. The study findings are also consistent with other studies, which reported the prevalence of overweight and obesity of public health significance among nurses in Angola and Ghana. The use of WHR for central obesity (14) also demonstrated in this study that female nurses and midwives were at a higher risk of CVDs such as hypertension, diabetes, and arteriosclerosis than their male counterparts (39.1% female vs 32.0% male). This finding agrees with that of Toba et al. (2015 who reported a high prevalence of central obesity in Iranian female nurses as compared to males and also depicted their risk for such chronic diseases. Furthermore, the use of WC that revealed central or abdominal fat accumulation prevalence of 61.9% among this study population (79.7% female vs 18.0% male) implies increased risk of obesity-related metabolic complications. The pattern of body fat distribution as measured by WHR and WC has

been reported to be a more important determinant of chronic diseases than general obesity (15).

Risk Factors Contributing to Overweight and Obesity in the Study Population

It has been established that socio-demographic and socio-economic statuses are related to overweight and obesity in many populations (16). Most of the nurses in this study are urban dwellers. Likewise, in this study, sex and having a single job were positively associated with obesity and overweight. Doing moderate leisure time exercise cofounded the relationship between having one job and having abnormal obesity and overweight. The female gender has always been identified as a risk factor for obesity and overweight. Many studies have shown that obesity is more common in females than in males. Likewise, having a single job was associated with obesity and overweight. This is probably because it reduces the moderate exercise most nurses report at work and increases the sedentary nature of life. Many studies have shown that unhealthy lifestyle behaviors, particularly lack of exercise, which invariably leads to low physical activity, contribute significantly to overweight and obese tendencies (17). This existing knowledge supports the findings of this study, which found that the rate of physical inactivity (no or low exercise levels) was very high and was positively associated with obesity and overweight. This was due to the nature of nurses' occupation and various sedentary tendencies associated with their job, thus posing a significant risk of becoming overweight and obese as well as developing central obesity, which may have serious consequences on their health and performance within the health service.



Generalizability of the study

Although this study was conducted at Uganda's largest national referral hospital, the findings are likely applicable to nurses working in other tertiary hospitals with similar work environments, staffing patterns, and shift schedules. However, caution should be exercised when generalizing these findings to nurses working in lower-level health facilities or rural settings where occupational characteristics may differ.

Conclusions

The prevalence of overweight was 36.9%, and that of obesity 33.5%, which is high. The prevalence of obesity was higher among females at 44.7% vs 6% in males, while that of overweight was higher among males at 42.0% vs 34.9% in females. Abdominal obesity was also high at 61.8% by WC and 36.9% by WHR. Female sex and having two jobs were statistically significant factors associated with obesity and overweight.

Limitations of the study

The rate of non-response was high. This could have been a potential source of selection bias. The targeted number of participants was not achieved. This could have affected the power of the study to make conclusions.

Recommendations

Nurses need to change their lifestyles both at work and at home to control obesity and overweight. They need to do more planned exercise and eat a healthier diet. Mulago hospital authorities need to plan and implement programs that fit in the busy schedules of nurses for the control of overweight and obesity among their nurses. These measures include wellness and fitness programs such as jogging, gymnasium, etc. Studies on obesity and overweight among nurses from other hospitals countrywide need to be done, and comparisons made with nurses from Mulago Hospital. Also, more studies on obesity and overweight and other CVD risk factors should be done among other health workers, since most of them have almost similar working conditions and lifestyles as nurses.

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Conflict of Interest

The authors declare no conflict of interest.

List of Abbreviations

Abbreviation	Meaning
BMI	Body Mass Index
CI	Confidence Interval
CVD	Cardiovascular Disease
MakSOMREC	Makerere University School of Medicine Research and Ethics Committee
MNRH	Mulago National Referral Hospital
PR	Prevalence Ratio
STEPS	STEPwise Approach to Surveillance
WC	Waist Circumference
WHO	World Health Organization
WHR	Waist-Hip Ratio

Author Contributions

MC conceived the study idea, developed the protocol, guided data collection, analysed the data, interpreted the findings, drafted the manuscript, and approved the final version.

OAN participated in interpreting results and drafting the manuscript

Data Availability

The datasets generated and analysed during the current study are available from the corresponding author upon reasonable request at the email mbbzceaser1@gmail.com.

Author Biography

Mbabazi Ceaser is a registered nurse at the Uganda Heart Institute and a holder of a Master's degree in Clinical Epidemiology and Biostatistics from Makerere University College of Health Sciences. His research interests include cardiovascular disease prevention, nursing workforce health, epidemiology, and implementation research.

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