

Research Article

A Prevalence of Overweight and Obesity and Associated Lifestyle Patterns Among Adults in Ilala City and Mkuranga District, Tanzania

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Abstract

Introduction: Overweight and obesity are significant global public health challenges associated with adverse burdens on the quality of life and mortality due to their association with non-communicable diseases. Early identification and control of these conditions are vital to mitigating their impact. **Methods:** A cross-sectional study was conducted among 339 respondents in Ilala City (urban) and Mkuranga district (rural) to assess the prevalence and determinants of overweight and obesity among adults. Data were collected on lifestyle, nutrition and demographic characteristics, and anthropometric measurements of height, weight, fat mass%, and waist and hip circumference were measured. Statistical analysis was conducted using SPSS version 27. **Results:** The overall prevalence of overweight and obesity was 26% and 18.9% respectively. In Ilala City, 61.1% of respondents was either overweight (32.2% or obese (28.7%), and in Mkuranga district, the prevalence of overweight was 19.2% and that of obesity was 8.3%. Key factors negatively associated with overweight and obesity included rural residence (AOR = 0.25; 95%CI (0.14 – 0.47); P = 0.000), income (AOR = 0.2; 95%CI (0.1 – 0.5); P = 0.001), Vigorous physical activities (COR = 0.5; 95%CI (0.3 – 0.7); P = 0.002), and consumption of pulses (legumes, nuts and oil seeds) (AOR = 0.1; 95%CI (0.01 – 0.2); P = 0.026), and positively associated with sex (AOR = 3.65; 95%CI (2.1 – 6.3); P = 0.000), where by female respondents were more overweight or obese than males, low education (AOR = 7.6; 95%CI (1.2 – 48.5); P = 0.03) in which primary school education were at higher risk of being overweight or obese, and spending less than 75 minutes per week for vigorous physical activities (COR = 2.6; 95%CI (1.7 – 4.12); P = 0.000) were by respondents with sedentary lifestyle are at higher risk of being overweight or obese. **Conclusion:** The findings suggest that urbanization, sex, education level, physical activity, and dietary habits are significant predictors of overweight and obesity. This serves as a benchmark for planning further studies aiming at reducing the prevalence of overweight and obesity among the adult population through well-designed interventions.

Keywords

Overweight and Obesity, Lifestyle Factors, Dietary Habits, Ilala City, Mkuranga District, Adults

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Received: 5 June 2025; **Accepted:** 19 June 2025; **Published:** 8 July 2025



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1. Introduction

Overweight and obesity are caused by chronic excessive fat accumulation in the adipose tissue due to a chronic imbalance between energy intake and energy expenditure [1]. Body Mass Index (BMI) is used to determine if the respondent is overweight or obese. BMI between 25 – 29.9 kg/m² is classified as overweight and ≥ 30 kg/m² as obese [2]. Overweight and obesity are risk factors for non-communicable diseases (NCDs) like type 2 diabetes mellitus, heart disease, hypertension, certain cancers, poor bone health, and reproduction [3]. Respondent with BMI ≥ 30 kg/m² is extremely high risk of NCDs. Nevertheless, NCD risk status can be classified by using body fat percentage or fat distribution. Respondent is at risk if the fat mass percentage (FM%) is above 30% and 20% for females and males respectively [4] and the fat distribution (Waist – to – hip ratio) is above 0.85 and 0.9 for females and males respectively [5].

Overweight and obesity are significant global public health challenges associated with adverse burdens on quality of life, morbidity, and mortality. Obesity is estimated to be the fifth leading risk factor for death worldwide [6]. Globally, the prevalence of adults overweight and obesity is 38% and 14% [7], in Africa, the prevalence is 27% and 8% [8], and in Tanzania, overweight and obesity among females is 36% and among males is 17% [9]. The prevalence of overweight and obesity is increasing at a higher rate, particularly among females of reproductive age. In Tanzania, the prevalence of overweight and obesity is higher in urban areas (23% for females and 6.4% for males) compared to rural areas (8.8% for females and 1.8% for males) [9].

The rise in overweight and obesity is associated with rapid urbanization and rapid economic growth resulting in a nutrition transition characterized by a sedentary lifestyle and poor physical activities [10] and increased consumption of foods high in fat and sugar. The higher prevalence of overweight and obesity has been attributed to plenty of low-price alcohol, processed products or fast food in shops and restaurants, and well- organized infrastructures that influence poor vegetable and fruit consumption [11]. Lack of vigorous physical activity, alcoholism, smoking, poor eating habits and stressful neighborhoods have been experienced in urban [12]. In rural areas, obesity rates have recently increased as a result of industrialization and adaptation to urban lifestyles.

Overweight and obesity are leading causes of morbidity and mortality in Tanzania [12]. The high prevalence of overweight or obesity in Ilala City and unknown status in Mkuranga district is particularly concerning because it is reversing many health strategies for tackling NCDs. Also, a high proportion of adults in Tanzania including Ilala City and Mkuranga district are less aware of the lifestyle factors associated with the development of overweight and obesity [13]. Therefore, early identification and control of overweight and obesity are regarded as an effective strategy for controlling NCDs [14]. This study aimed to assess the prevalence of

overweight and obesity among adults living in Ilala City and Mkuranga rural district. In addition, we examined lifestyle factors associated with overweight and obesity.

2. Materials and Methods

2.1. Description of the Study Area

The study was conducted in urban (Ilala City) and rural (Mkuranga district). Ilala City is located 6°55' 4.98" S 39°09' 45.14" E in Dar es Salaam Region. Mkuranga district is located at Latitude 7°7' 36.43" to the South of the Equator and Longitude 39°12' 13.14" to the East of the Greenwich. Ilala City is organized into three administrative divisions: Ilala, Ukonga, and Kariakoo. Mkuranga district is one of the six districts of the Coast Region and is divided into 4 divisions. Agriculture and fishing are the principal economic activities in Mkuranga district. In Ilala City, data collection was conducted in Ukonga division where the respondents from Kinyerezi ward in the northern part of the division and Gongo la Mboto ward in the west participated in the study. Mkuranga district is divided into semi-urban and rural areas. This research was conducted in the rural area (Mkamba division). In the Mkamba division, the respondents from the Mkamba and Shungubweni wards were recruited for the study.

2.2. Study Design

The cross-sectional study design was used to collect data from respondents from February to March 2024. Various variables were examined within a simple population at a specific point in time.

2.3. Sample Size Determination

The sample size was determined using the formula ($N = Z^2 * P * (1-P) / I^2$) [15]. Where N = estimated sample size, Z = z score at 95% confidence interval (1.96), I = marginal error (0.05), and P = proportional of overweight and obesity (50%) for unknown prevalence. By using the above formula, the calculated minimum sample size was 384. A 5% margin was added to cover for attrition. A total of 403 respondents were randomly recruited to participate in the study. Simple random sampling was used to select respondents from a list of FoCo Active Project, list of respondents, the number of females is two times higher than males (229 males: 486 females).

Selection of wards: Simple random sampling was applied in both districts to obtain two urban-wards (Gongo la Mboto and Kinyerezi) in Ilala City and another rural-ward (Mkamba) in the Mkuranga district. In this technique, all wards in each residence were listed and numbered in a computer Excel sheet

(cell A1). Then the computer program (Excel) generated random numbers in column B, next to each ward number by typing (=RAND()) and dragging to the last cell. After generating random numbers, then, the list based on the random numbers in column B was sorted from smallest to largest. In each ward, proportionate sampling was applied to choose respondents from the FoCo Active project list to be included in the study. Then, contact was made through mobile phone. In Gongo la Mboto ward, those selected respondents were informed to meet for data collection at Mwangaza primary school, Kinyerezi primary school for respondents from Kinyerezi ward, and Mkamba primary school for those respondents from Mkamba and Shungubweni ward.

2.4. Inclusion and Exclusion Criteria

Adults aged 18 years and above who were permanent residents of selected households were eligible to be interviewed. Adults unable to stand, pregnant women, chronically ill, and temporary residents of selected households were excluded from the study.

2.5. Data Collection

Lifestyle patterns: The WHO STEP SURVEY Instrument was adapted, translated into Swahili version, and used for data collection [16]. This tool was applied to collect demographic information (marital status, age, education, employment status, income) and lifestyle behaviors such as nutritional factors, smoking, alcohol consumption, and physical activity.

Anthropometry: Weight was measured by using a standard weighing scale (digital electronic SECA scale; Model 8811021659, Germany) placed on a firm horizontal surface. The respondents were weighed without shoes and with light clothing, and the weight was recorded to the nearest 0.1 kg. Height was measured using a Stadiometer (Model No PE-AIM-101-USA). Respondents were standing upright without shoes, with arms at the sides and shoulders level, looking straight ahead, and a line of sight was parallel with the floor, with head, shoulders, buttocks, and heels touching the flat surface of the Stadiometer. The height was recorded to the nearest 0.1 cm. body weight and height were used to compute Body Mass Index (BMI) using this equation; $BMI = \text{Weight (kg)} / \text{Height (M)}^2$. The BMI was used to assess the prevalence of overweight and obesity such that respondents with BMI between 25 – 29.9 kg/m² classified as overweight and $\geq 30 \text{ kg/m}^2$ as obese.

Fat Mass: Fat mass was measured by using Tanita bioelectrical impedance analyzer (BIA) (Model, Tanita MC-180MA (Tanita, Tokyo, Japan). Respondents were requested to remove shoes, socks, and metal materials like watches and earrings, and then allowed to stand with two feet on the scale. Two body fat measurements were taken at an interval of three minutes. The average value of fat content was used to determine body composition by calculating body

fat-free mass and fat mass.

Waist and hip circumference: Measurements of waist and hip circumference were taken at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest. The hip circumference was measured around the widest part of the client's buttocks. Waist and hip circumference were measured using non-stretchable measuring tapes (Bouncing Rabbit, China). The measurements were made with the tape measured held snugly but not constricting at a level parallel to the floor. The respondents were standing with arms at the sides, feet close together, and weight evenly distributed across the feet. Waist hip ratio was calculated as waist (cm) / hip (cm). Interpretation of results was done according to the World Health Organization criteria: ≥ 0.85 for females and 0.9 for males [17]. Waist hip circumference was used to assess fat distribution (abdominal obesity).

Physical activities: Respondents were asked to recall and estimate the amount of time they spent doing different types of activities including walking, working, sports, and recreational over one week before the survey. The physical activity was measured according to WHO recommendations [18].

Dietary habits: Respondents were asked to recall number of days per week a particular food was eaten and estimate the size and number of foods from a particular food group (fruits, vegetables, free sugars, meat or fish, cereals, roots, and tubers and pulses (legumes) consumed per day. The portion size of the food consumed was converted into grams by multiplying the portion consumed by the measured weight of the food listed in the photobook created for the study. The recall was simplified using nutrition cards showing some examples of these food groups. Each picture represented the size of the serving. The interpretation was conducted according to Tanzania's mainland Food Based Dietary Guidelines [19], and free sugar; WHO dietary recommendations were used [20].

2.6. Study Variables

Independent variables: Demographic information including sex, age, place of residence, marital status, education level, income and employment status. Lifestyle patterns such as dietary habits, smoking, drinking alcohol, and physical activities.

Dependent/ outcome variables: Overweight and obesity.

2.7. Statistical Analysis

The data collected was entered into MS Excel and cleaned to remove errors. Then data were transferred into IBM SPSS Statistics version 27 for analysis with statistical significance at $p < 0.05$. descriptive statistics such as frequencies (n), percentages (%), means and standard deviation (SD) were used for numerical or continuous variables to describe the physical characteristics of respondents. Pearson Chi-square test was used to examine associations between the dependent variables (overweight and obesity) and independent variables

(Nutritional factors, place of residence, sex, education, income, alcohol consumption, smoking, and age). All significant variables at a p-value of < 0.05 in Pearson Chi-square tests were selected for logistic regression analysis to adjust the effect of confounders.

2.8. Ethical Consideration

The study obtained ethical approval from the Tanzania National Institute of Medical Research (NIMR) with reference number NIMR/HQ/R.8a/Vol. IX/3941, and permission to conduct the study was obtained from Sokoine University of Agriculture. Additional permission was obtained from the Ilala City Council, Mkuranga district Council, and individual wards (Gongo la mboto, Kinyerezi and Mkamba). Informed verbal and written consents were obtained from all respondents after they were informed of the study objectives, and voluntarily agreed to participate in the study.

3. Results

3.1. Demographic Characteristics

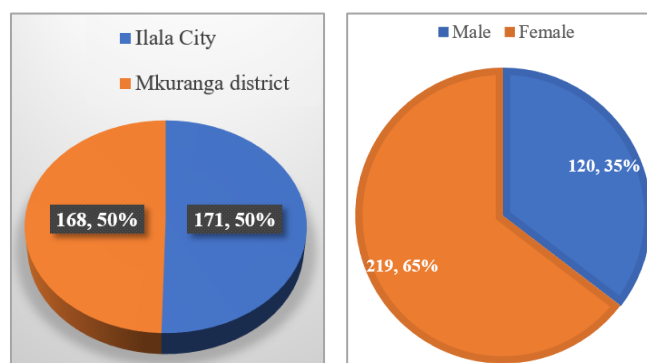


Figure 1. Distribution of respondents according to Residence and Sex.

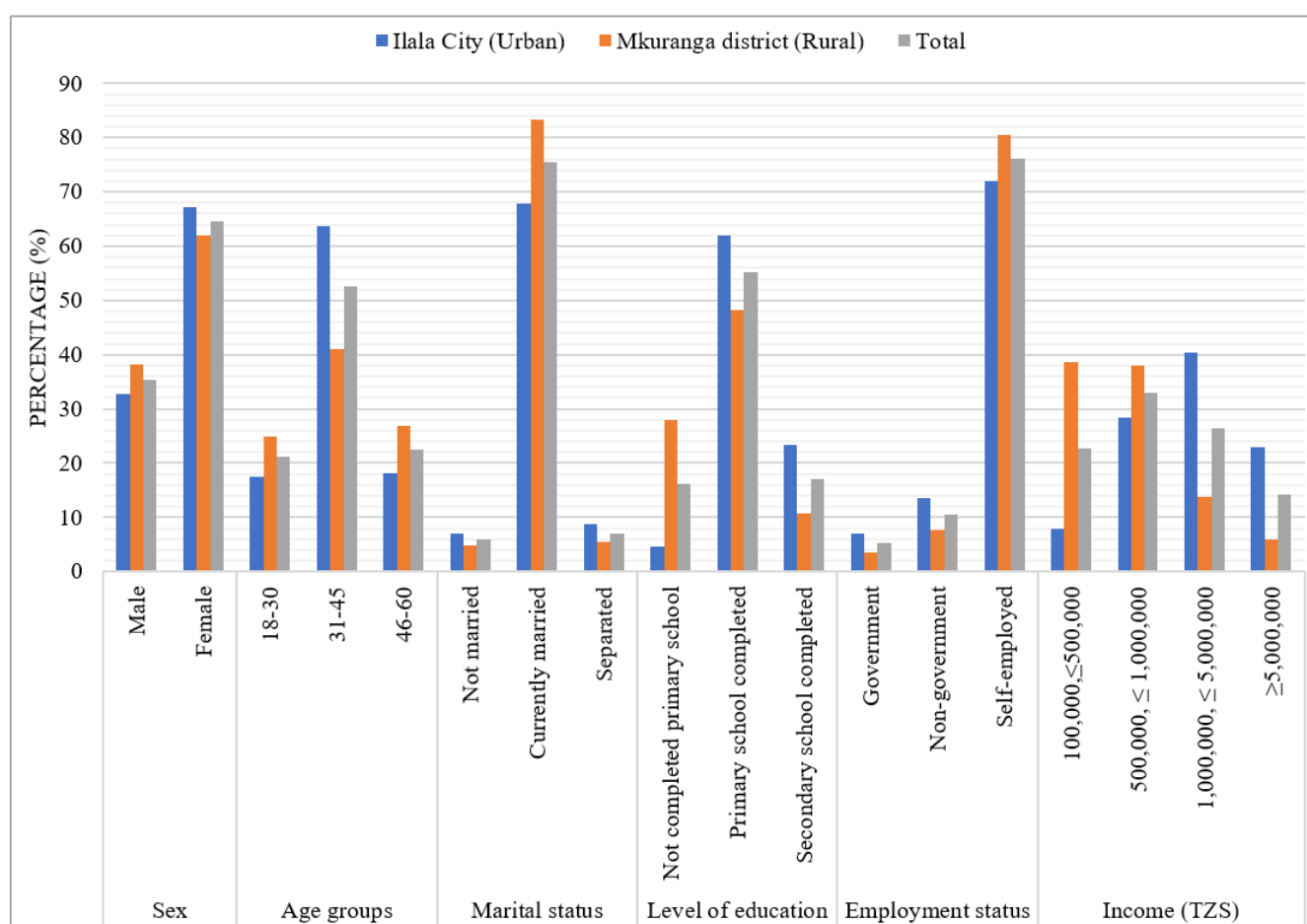


Figure 2. Demographic characteristics of respondents.

The study included respondents from Ilala City (urban) and Mkuranga district (rural) where 339 respondents participated.

The sample included fifty percent (171) respondents from Ilala City and fifty percent (168) from Mkuranga district. Sixty-five

percent of the respondents were females and 35% were males (Figure 1). The age range between 31 and 45 represented 53% of the respondents. About fifty-five percent of the respondents had completed primary and 17% of secondary education. Seventy-six percent were self-employed and 75.5% were married. In Ilala City, 40.4% had an annual income of between 1,000,000 and 5,000,000TZS, and in Mkuranga district, only 13.7% reached that level of income (Figure 2).

3.2. Anthropometric Characteristics of Respondents

The anthropometric characteristics of respondents are

presented in Table 1. The overall mean weight was 60.3 ± 18.5 kg, (37 to 114kg IQR). Overall mean height was 151 ± 34.6 cm, (141-185cm IQR). The average age of respondents in both districts was 39.6 ± 11 years ranging from 18-80 years. The mean fat mass percentage of females was $20.5\% \pm 17.3\%$, with IQR of 9.8-56% and that of males was $7\% \pm 10\%$, (5.5-35.3% IQR). The mean waist circumference for females was 48.9 ± 44 cm (39-135 cm IQR) and mean hip circumference was 58 ± 52 cm, (44-141cm IQR). The mean waist circumference for males was 21 ± 35 cm, (58-109cm IQR), and the mean hip circumference was 24 ± 39.7 cm, (65-115cm IQR).

Table 1. The anthropometric characteristics of respondents.

Variables	Total		Ilala city		Mkuranga district	
	Mean (SD)	IQR	Mean (SD)	IQR	Mean (SD)	IQR
Weight (kg)	60.3 $\pm$ 18.5	37-114	66.5 $\pm$ 16.8	43-114	54 $\pm$ 18	37.2-94
Height (cm)	151 $\pm$ 34.6	141-185	155 $\pm$ 25.3	141-185	147.6 $\pm$ 41.8	143-184
Age (years)	39.6 $\pm$ 11	18-80	38 $\pm$ 8.4	18-63	41 $\pm$ 12.5	20-80
Fat Mass% (Female)	20.5 $\pm$ 17.3	9.8-56	23.6 $\pm$ 18.4	21.3-56	17.3 $\pm$ 15.4	9.8-45
Fat Mass% (Male)	7 $\pm$ 10	5.5-35.3	7 $\pm$ 10.7	14.7-31.7	6.7 $\pm$ 9.5	5.5-35.3
Waist circumference (cm) (female)	48.9 $\pm$ 44	39-135	54.3 $\pm$ 46.4	39-135	43.4 $\pm$ 40.4	57-110
Hip circumference (cm) (female)	58 $\pm$ 52	44-141	64 $\pm$ 53	44-141	53 $\pm$ 49	76-117
Waist circumference (cm) (male)	21 $\pm$ 35	58-109	19.9 $\pm$ 36	58-109	22.8 $\pm$ 34	58-103
Hip circumference (cm) (male)	24 $\pm$ 39.7	65-115	22.3 $\pm$ 40.3	65-115	26 $\pm$ 39	65-98

SD = Standard deviation, IQR = Interquartile range

3.3. Prevalence of Overweight and Obesity

The results in Figure 3 present the prevalence of overweight and obesity among respondents in the study areas. The prevalence of overweight and obesity in the study population was 45%. In Ilala City, the prevalence of overweight and obesity was significantly higher (61.1%) compared to 27.6% in Mkuranga district. Overweight and obesity vary when different indices are used; BMI classification of ≥ 25 kg/m² shows that the overall prevalence of overweight and obesity among female respondents was 55%, 58.9% when a threshold of $\geq 30\%$ fat mass was used, and 66.5% when $\text{WHR} \geq 0.85$ was used. Among males, the overall prevalence was 26% under

the BMI classification and changed to 47% when the fat mass threshold of $\geq 20\%$ was used, and to 38% when $\text{WHR} \geq 9$ classification was used. Similarly, BMI shows the prevalence among females (68%) and males (45%) higher in Ilala City compared to their counterparts in Mkuranga district (females 39% and males 8.5%). The FM% threshold showed that 74% of female and 64% of male respondents in Ilala City had abdominal obesity higher than their counterparts in Mkuranga district (females 38% and males 34%). In Ilala City, the WHR classification indicates that the prevalence of abdominal obesity was 82.3% among females and 36% for males higher than their counterparts in the Mkuranga district (58.7% for females and 33% for males).

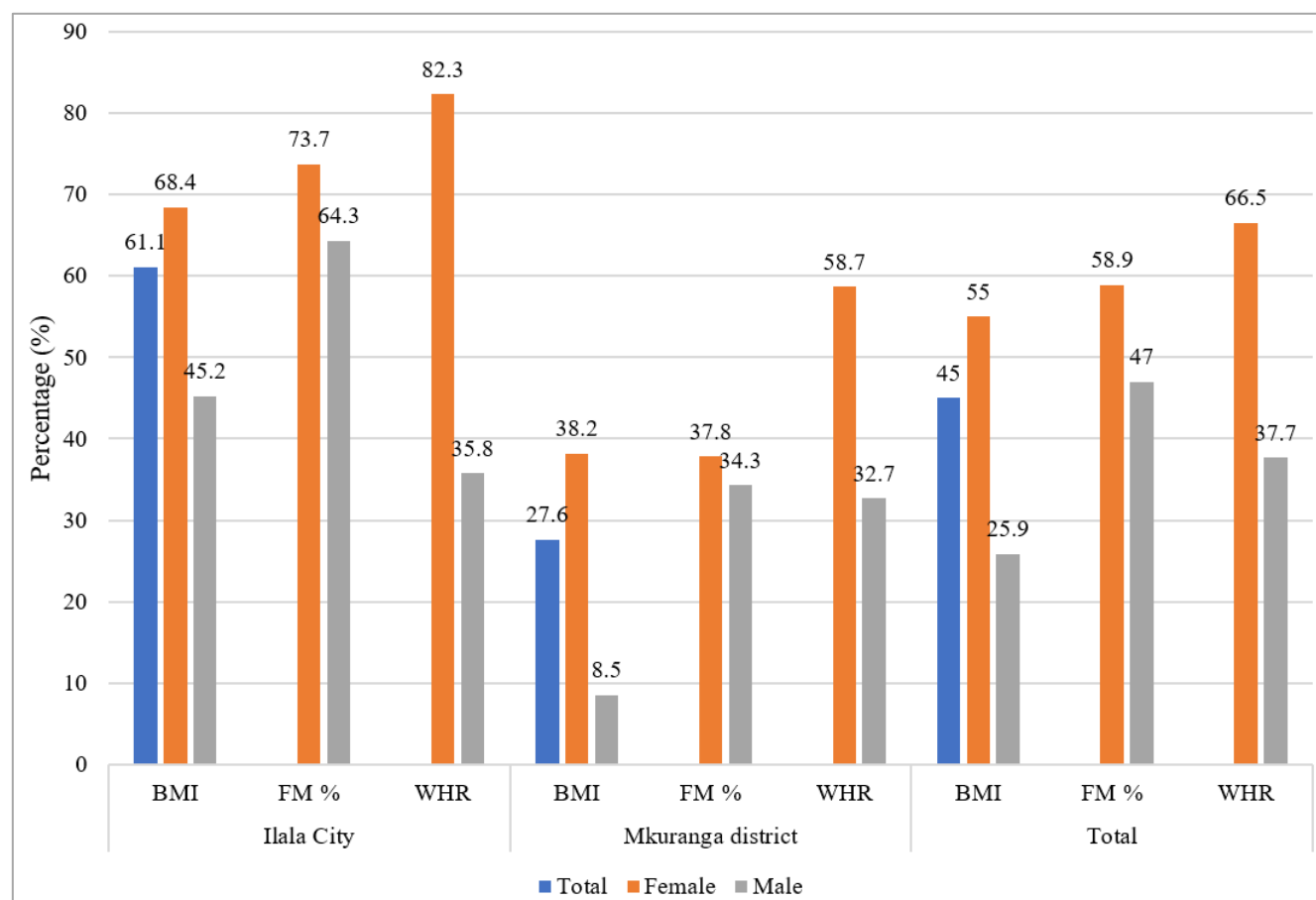


Figure 3. Prevalence of overweight and obesity.

3.4. Lifestyle Patterns of Respondents

Results of the lifestyle pattern are presented in Table 2. The prevalence of weekly smoking was significantly higher in the Mkuranga district (77%) than in Ilala City (55%) ($P < 0.05$). In Ilala City, only 28% of the respondents consumed alcohol compared to 24% in Mkuranga district. Nevertheless, the frequency of consumption (3-4 days per week) was higher in Mkuranga district (29%) than in Ilala City (17%). Vigorous-intensity physical activities were performed by 34% of

respondents in Ilala City and 84% in Mkuranga district ($P < 0.05$). Moderate-intensity activities were higher in Ilala than in Mkuranga but the difference was not statistically significant. The mean time spent on vigorous physical activities in Mkuranga district was 136 (SD 91.9) minutes and 34.7 (SD 86.2) in Ilala City. Moderate-intensity activities were performed by 19% of respondents in Ilala City and 14% in Mkuranga district. However, 80% of respondents in Ilala City and 71% in Mkuranga district reported walking or cycling for at least 10 minutes continuously.

Table 2. Lifestyle patterns of respondents.

Variables	Ilala City		Mkuranga district		Total		P - value
	n	%	n	%	n	%	
Smoking status							
Smokers	11	6.4	17	10.1	28	8.3	0.657
Non-smokers	160	93.6	151	89.9	311	91.7	
Smoking pattern							
Daily smokers	5	45.5	4	23.5	9	32.1	0.000

Variables	Ilala City		Mkuranga district		Total		P - value
	n	%	n	%	n	%	
Weekly smokers	6	54.5	13	76.5	19	67.9	
Consumption of alcohol							
Alcohol consumers	48	28.1	41	24.4	89	26.3	0.211
Non-alcohol consumers	123	71.9	127	75.6	250	73.7	
Alcohol consumption pattern							
3-4 days per week	8	16.7	12	29.3	20	22.5	0.235
1-2 days per week	23	47.9	17	41.5	40	44.9	
less than once a month	8	16.7	7	17.1	15	16.9	
Vigorous intensity activities							
Yes	58	33.9	141	83.9	199	58.7	0.000
No	113	66.1	27	16.1	140	41.3	
Moderate intensity activities							
Yes	33	19.3	24	14.3	57	16.8	0.305
No	138	80.7	144	85.7	282	83.2	
Walk or use a bicycle for at least 10 minutes continuously							
Yes	137	80.1	119	70.8	256	75.5	0.078
No	34	19.1	49	29.2	83	24.5	
Meantime used (minutes)	n	Mean (SD)	n	Mean (SD)	n	Mean (SD)	
Vigorous intensity activities	171	34.7 ±86.2	168	136 ±91.9	339	229.2 ±227.8	
Moderate intensity activities	171	148.6 ±634	168	51.6 ±240.7	339	100.5 ±482.9	

vigorous-intensity activities are those activities that increase the heart rate between 70% to 85% of your maximum heart rate, Moderate-intensity activities refer to activities that cause the heart rate to increase between 50% and 70%, Walk or using a bicycle for at least 10 minutes continuously means to either walk briskly or ride a Bicycle for a minimum of 10 minutes without stopping, essentially encouraging a short burst of moderate-intensity activities

3.5. Dietary Habits

Dietary habits are presented in Figure 4. The consumption of fruits was higher in Mkuranga district (15%) than in Ilala City (12.9%) though the magnitude was not statistically significant. The consumption of ≥ 280 g of vegetables was statistically higher in the Mkuranga district (29.3%) than in Ilala City (16.4%). The consumption of vegetables in Ilala City was higher among males (18%) than in females (15.7%) whereas in Mkuranga district, the consumption of vegetables was statistically higher among females (32.7%) than in males (23.4%). Consumption of more than 30g of added sugars for more than 5 days per week was statistically higher in Ilala

City (29.2%) than (8.9%) in Mkuranga district. In Ilala City, the consumption of added sugar was higher among female respondents (34%) than males (19.6%) while in Mkuranga district, the consumption of added sugar was higher among males (12.5%) than among female respondents (6.7%).

The consumption of at least 580 g of energy-dense foods per day was statistically higher among female respondents than males in Ilala City and Mkuranga district although the difference in magnitude was not significant. The consumption of pulses (legumes, nuts, and oily seeds) more than 5 days per week was statistically higher in Mkuranga district (92%) than in Ilala City (77%). In both districts, the magnitude of consumption of pulses between males and females was statistically similar.

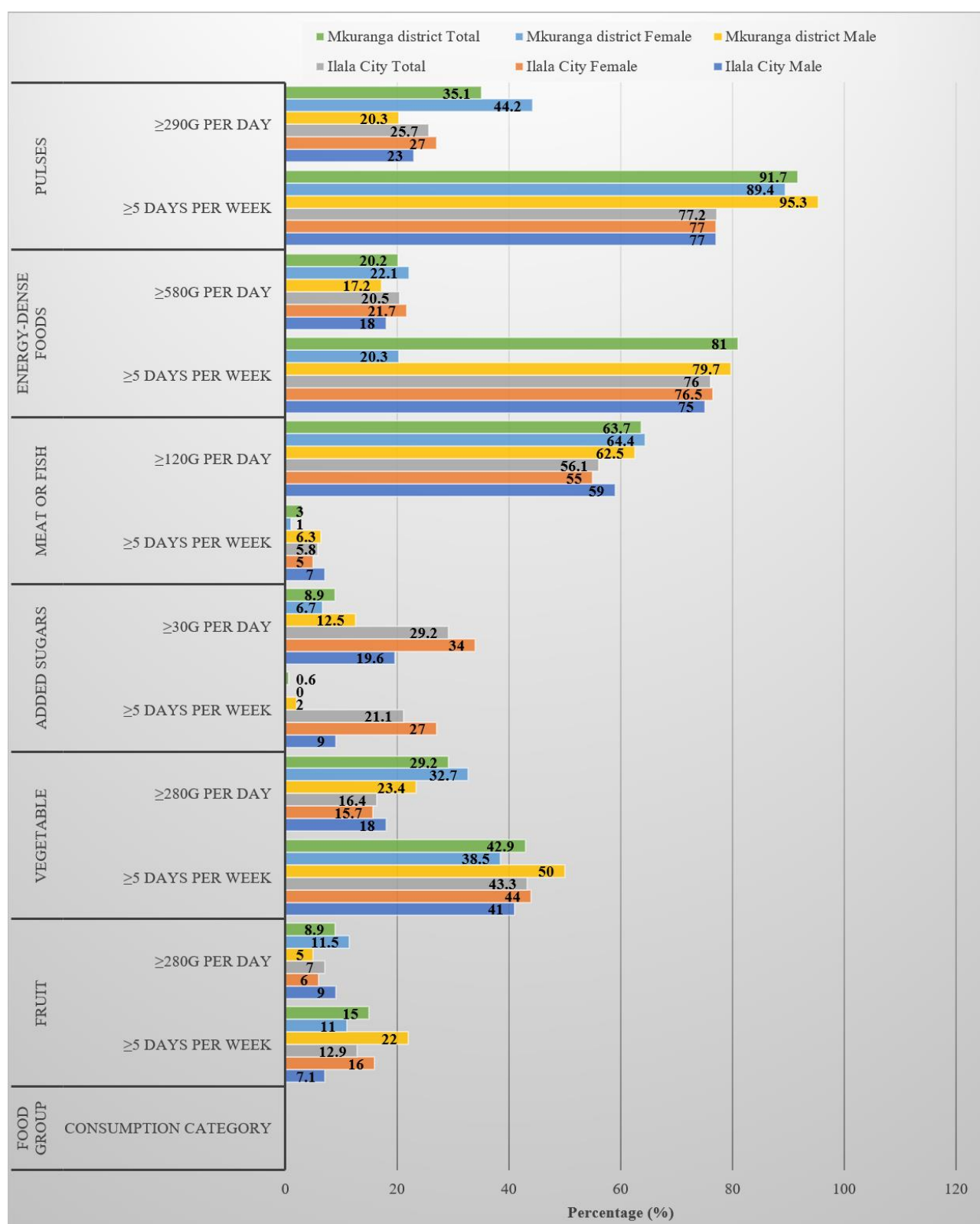


Figure 4. Dietary habits of respondents.

3.6. The Relationships Between Dietary Habits and Overweight or Obesity

The relationship between dietary habits and overweight or

obesity is presented in Table 3. The consumption of more than 290g of pulses (legumes, nuts, and oily seeds) per day was significantly associated with overweight and obesity ($P < 0.05$).

Other factors such as consumption of fruits, vegetables,

added sugars, meat or fish, pulses, and energy-dense foods at least 5 days per week were not statistically significantly associated with overweight or obesity ($P > 0.05$). Also, factors such as the consumption of more than 280g of fruits, 280g of

vegetables, 30g of added sugars, 120g of meat or fish, and 580g of energy-dense foods per day were not statistically significantly associated with overweight or obesity ($P > 0.05$).

Table 3. Chi square test for the relationship between dietary habits and overweight or obesity.

		Ilala city		Mkuranga district		Total		
		Overweight and obesity		Overweight and obesity		Overweight and obesity		
Food group	Consumption category	n	%	n	%	n	%	P-value
Fruit	More than 5 days per week	7	31.8	0	0	7	14.9	0.449
	Less than 5 days per week	41	28.3	13	9.9	54	19.6	
	More than 280g per day	3	25	2	13.3	5	18.5	0.959
	Less than 280g per day	45	29	11	7.8	56	19	
Vegetable	More than 5 days per week	26	36.1	8	9	31	22.3	0.173
	Less than 5 days per week	22	23.2	5	7.5	30	16.3	
	More than 280g per day	10	40	8	18.6	18	26.5	0.072
	Less than 280g per day	38	26.8	5	4.4	42	16.9	
Added sugars	More than 5 days per week	10	27.8	13	8.4	10	27	0.179
	Less than 5 days per week	38	29	0	0	51	17.8	
	More than 30g per day	15	30.6	1	7.7	16	25.8	0.121
	Less than 30g per day	33	20	12	8.4	45	17.2	
Meat/fish	More than 5 days per week	5	50	0	0	5	35.7	0.1
	Less than 5 days per week	43	27.4	13	8.6	56	18.1	
	More than 120g per day	28	30.1	7	7.1	35	18.2	0.715
	Less than 120g per day	20	27	6	10.5	26	19.8	
Energy-dense foods	More than 5 days per week	36	28.6	8	6.3	44	17.5	0.218
	Less than 5 days per week	12	29.3	5	16.7	17	23.9	
	More than 580g per day	11	32.4	3	9.7	14	21.5	0.541
	Less than 580g per day	37	27.8	10	8	47	18.2	
Pulses	More than 5 days per week	38	29.7	12	8.5	50	18.5	0.704
	Less than 5 days per week	10	25.6	1	7.1	11	20.8	
	More than 290g per day	9	21.4	3	5.4	12	12.2	0.044
	Less than 290g per day	39	31.2	10	10	49	21.8	

3.7. Factors Associated with Overweight and Obesity

The findings indicate that overweight and obesity were

significantly associated with various sociodemographic and lifestyle factors (Table 4). Specifically, the prevalence of overweight and obesity was higher among respondents residing in Ilala City, Females, those engaging in vigorous physical activities, respondents who spent more time on vigorous physical activities, highly educated, married, and re-

spondents with high income. All these associations were statistically significant with a p-value < 0.05, suggesting that

these factors play a role in the prevalence of overweight and obesity in the population

Table 4. Chi square test for factors associated with overweight and obesity.

	Ilala City		Mkuranga district		Total				
Variables	Overweight+Obesity		Overweight+ Obesity		Overweight+ Obesity			df	P-value
	n	%	n	%	N	%	x ²		
Smoking status									
Smokers	6	50	3	18.8	9	33.3	1.591 ^a	1	0.207
Non smokers	97	62.2	40	28.6	136	45.9			
Alcohol consumption status									
Alcohol consumers	31	72.1	12	30.8	44	52.4	2.574 ^a	1	0.109
Non-Alcohol consumers	71	57.3	31	26.5	101	42.3			
Place of residence	102	61.1	43	27.6	145	44.9	36.619 ^a	1	0.000
Sex									
Female	78	68.4	38	39.2	116	55	25.015 ^a	1	0.000
Male	24	45.3	5	8.5	29	25.9			
Vigorous activity									
Yes	35	60.3	36	27.3	71	35.7	9.905 ^a	2	0.007
No	66	61.1	7	29.2	73	55.3			
Mean time spent for vigorous activity									
<75 minutes	26	54.2	33	26.2	59	33.5	20.205 ^a	1	0.000
≥75 minutes	76	63.9	10	33.3	86	58.5			
Moderate activity									
Yes	20	62.5	8	27.3	26	48.1	2.326 ^a	3	0.508
No	81	60.9	37	27.6	118	44.2			
Mean time spent for moderate activity									
<150 minutes	90	62.1	42	29	132	45.5	0.449 ^a	1	0.503
≥150 minutes	12	54.5		1	9.1	39.4			
Marital Status									
Married	7	58.3	2	25	9	45	11.894 ^a	6	0.064
Not married	69	60.5	35	26.7	104	42.4			
Level of education									
No formal schooling	8	61.5	13	21.7	21	28.8	11.907 ^a	4	0.018
Primary school	69	67.6	23	29.9	92	51.4			
Secondary school	20	50	7	41.2	27	47.4			
College/university	5	45.5			5	38.5			
Income (TZS)									
100,000≤ 500,000	8	61.5	20	32.8	28	36.4	25.620 ^a	5	0.000

	Ilala City		Mkuranga district		Total				
Variables	Overweight+Obesity		Overweight+ Obesity		Overweight+ Obesity			df	P-value
	n	%	n	%	N	%	x ²		
500,000≤ 1,000,000	21	46.7	8	13.6	29	25.9			
1,000,000≤ 5,000,000	41	63.1	10	45.5	51	56.7			
≥5,000,000	28	73.7	4	40	32	66.7			

3.8. Association of Overweight and Obesity with the Selected Variables

Place of residence, sex, level of education, and income were significantly associated with overweight and obesity (Table 5). Residents of Mkuranga district were 0.75 times less likely to be overweight or obese compared to Ilala City (AOR = 0.25; 95%CI (0.1-0.5); $p = 0.000$). Female respondents were at 3.6 times higher risk of being overweight or obese compared to males (AOR = 3.6; 95% CI (2.1- 6.3); $p = 0.000$). Those who completed primary school education were 7.6 times at higher risk of being overweight or obese (AOR = 7.6; 95%CI (1.2-48.5); $P = 0.03$) than those who completed secondary or college education. The respondents with annual

income 500,000 ≤ 1,000,000TZS were significantly at lower risk of being overweight or obese (AOR = 0.2; 95%CI (0.1-0.5); $P = 0.001$) than those with > 1,000,000TZS. Vigorous physical activities were 50% protective against overweight and obesity (COR = 0.5; 95%CI (0.3-0.7); $P = 0.002$), and consumption of pulses was 90% protective against overweight and obesity (AOR = 0.1; 95%CI (0.01-0.2); $P = 0.026$). Spending < 75 minutes for vigorous physical activities per week was 2.6 times higher risk of overweight and obesity (COR = 2.6; 95%CI (1.7-4.12); $P = 0.000$). Other variables (smoking status, alcohol consumption, moderate-intensity activities, mean time spent on moderate physical activities, and marital status) were not statistically associated with overweight or obesity.

Table 5. Logistic regression of the factors associated with overweight and obesity.

Variables	Group or category	COR	95%CI	p-Value	AOR	95%CI	p-Value
Place of residence	Mkuranga district	0.24	0.2-0.4	0.000	0.25	0.1-0.5	0.000
	Ilala City	1			1		
Sex	Female	3.5	2.1-5.7	0.000	3.6	2.1-6.3	0.000
	Male	1			1		
vigorous activities	Yes	0.5	0.3-0.7	0.002	1.49	0.7-3.3	0.3
	No	1			1		
Mean time spent on vigorous activities	<75 minutes	2.6	1.7-4.12	0.000	0.6	0.3-1.4	0.3
	≥75 minutes	1			1		
Marital Status	Married	1.3	1.01-1.6	0.04	1.12	0.9-1.4	0.4
	Not married	1			1		
Level of education	No formal schooling	0.73	0.2-3.3	0.7	5.4	0.8-38.7	0.09
	Primary school	1.67	0.387-7.18	0.49	7.6	1.2-48.5	0.03
	Secondary school	1.47	0.32-6.67	0.62	5.4	0.8-35.8	0.08
	College/university	1			1		
Income (TZS)	<100000	1			1		

Variables	Group or category	COR	95%CI	p-Value	AOR	95%CI	p-Value
	100,000 ≤ 500,000	0.28	0.13-0.6	0.001	0.58	0.2-1.6	0.29
	500,000 ≤ 1,000,000	0.17	0.1-0.3	0.000	0.2	0.1-0.5	0.001
	1,000,000 ≤ 5,000,000	0.67	0.3-1.4	0.27	0.56	0.2-1.4	0.2
	≥ 5,000,000	1			1		
Pulses	≥290g per day		1.2-1.4	0.000	0.1	0.01-0.2	0.026
	<290g per day				1		

p-value: Logistic Regression; p < 0.05; AOR: Adjusted Odds Ratio; COR: Crude Odds Ratio; CI: Confidence Interval; TZS: Tanzanian Shillings

4.. Discussion

4.1. Prevalence of Overweight and Obesity

4.1.1. Prevalence of Overweight and Obesity in the Study Area

This study aimed to assess the prevalence of overweight and obesity among adults in Ilala City and Mkuranga rural districts. The prevalence of overweight and obesity in the study population was about 45% considered high and of public health significance. This may be attributed to the changes in lifestyles. An increase in urbanization influences sedentary lifestyles and the nutrition transition characterized by a shift from traditional diets (low in fat and sugar) to Western-style diets (high in fats, sugars, and processed foods). Vigorous-intensity activities and residence were significantly associated with overweight and obesity in the current study. The prevalence of overweight and obesity in the study population was higher than reported in the previous study [12, 13]. Also, the prevalence is lower than the results of the previous study [21, 22] which implies the adaptation to urban lifestyles, improved infrastructures such as transport, food market and improved agriculture system in Mkuranga district.

4.1.2. The Prevalence of Overweight and Obesity in Ilala City and Mkuranga District

The prevalence of overweight and obesity in Ilala City was higher (61.1%) approximately twice the prevalence in the Mkuranga district (27.6%). Respondents in the Mkuranga district (rural) were less likely to be overweight or obese than in Ilala City (urban). Ilala City is a fast-growing urban area characterized by a network of transport infrastructure and transport facilities including motorcycles (bi and tricycles), buses, and cars, which might influence an increased tendency for inactivity. Ilala City is also home to a diverse food environment containing both highly and minimally processed foods, which have resulted in increased consumption of highly/ultra-processed foods high in sugar, fat, and salt con-

tent. Living in the Mkuranga district (rural setting) influences more vigorous physical activities. The low prevalence of overweight and obesity in Mkuranga district is due to the high activity pattern and low influence of highly processed foods in Mkuranga district. The observation made in this study is similar to what was observed in north-western Ethiopia [23], the rural-urban comparative study of Bangladesh [24], Doda City [22], and Dar es Salaam [12]. This similarity implies that the prevalence of overweight or obesity is a threat to public health not only in Ilala City and Mkuranga district but is a global concern due to industrialization, improved infrastructures and the food market.

4.1.3. The Prevalence of Overweight and Obesity Using Different Indices

The current study showed the prevalence of overweight and obesity changed when different indices (WHR, and fat mass percentage) were used. Consistently, more female respondents (67%) were classified as being overweight or obese when the WHR index was used compared to fat mass percentage (59%) and BMI (55%). This is because respondents were adults and are supported by previous studies indicating that females who had given birth had less body fat and greater waist circumference [17]. For male participants, 47% were classified as being overweight or obese when FM% was used compared to WHR (38%) and BMI (26%) because males have greater total lean mass, bone mineral mass, less limb fat and a relatively greater central distribution of fat [25]. The high overweight and obesity prevalence in females when WHR is used suggests that a high proportion had a WHR of 0.86 or higher and is considered to be a high-risk group for NCDs. This prevalence is not captured by BMI or fat mass percent. This calls for careful consideration when these indices are used individually [26, 27].

4.1.4. Difference of Overweight and Obesity Between Females and Males

The prevalence of overweight and obesity was higher among females than among males in both study areas, which corresponds to the prevalence of the general population of Tanzania

[9]. The higher prevalence of overweight and obesity among females has been attributed to the female sex as the female sex was positively associated with overweight and obesity. This may be attributable to the body composition differences between sexes in which fat mass percentage was observed to be higher among females than males. Also, dietary habits as the consumption of at least 580 g of energy-dense foods per day were statistically higher among female respondents than males. Current findings are in line with published papers [28-32]. Nevertheless, the results by Younis *et al.*, (2023) showed that males were more likely to be overweight or obese than females [33]. This is evident that overweight and obesity are not constantly distributed among the population, but vary according to sex, race and dietary habits.

4.2. Factors Associated with Overweight and Obesity

Income did not show a clear correlation with overweight and obesity. However, respondents who were in the income category within $500,000 \leq 1,000,000$ TZS per year had a low prevalence of overweight and obesity. In the current study, most respondents (40.4%) in Ilala City possess $> 1,000,000$ TZS income which reflected a higher prevalence of overweight and obesity (61.1%) compared to 14% in the rural Mkuranga district which reflected a lower prevalence of overweight and obesity (27.6%). This implies that, as income increases overweight and obesity also increases. Current results correspond to other studies in Tanzania [13, 33, 34], and contrast the findings of [35, 36] which have shown that decreased income had a positive and significant association with overweight and obesity. This means that overweight and obesity are not associated only with high-income populations but are now also prevalent in low and middle-income populations.

The current study has shown that the level of education has a significant contribution to being overweight and obese. Primary school education level or less predisposed individuals to a 7.6 times likelihood to be overweight or obese than attainment of higher education (secondary and tertiary education). These findings may suggest individuals with low education have less exposure to information about proper nutrition, healthy lifestyles, and the long-term effects of obesity compared to people who proceed to secondary schools and tertiary education. In other studies, it was observed that the prevalence of overweight and obesity was higher among respondents who completed secondary school or university/college education [13, 37, 38].

The current study revealed that respondents who perform vigorous physical activities were less likely to be overweight and obese. A sedentary lifestyle is a risk factor for being overweight and obesity because more physical activities increase the calories your body uses for energy. This study emphasizes the importance of the beneficial effects of physical activities as part of our daily life, as supported by a recent World Health Organization recommendation which recom-

mends that all adults have to undertake 150–300 minutes of moderate-intensity or 75–150 minutes of vigorous physical activities or some equivalent combination of moderate and vigorous physical activities per week [18]. Failure to meet the recommended levels of physical activity is associated with an increased risk of overweight and obesity. The findings of the current study are consistent with those reported by previous studies [39-42]. Specifically, the present study demonstrated that individuals who engaged in vigorous physical activity for at least 75 minutes per week had a reduced likelihood of being overweight or obese.

The consumption of at least 290g of pulses (legumes, nuts, and oily seeds) per day was protective against the prevalence of overweight and obesity in both Ilala City and Mkuranga district (AOR = 0.1). Higher consumption of pulses in the study areas has been facilitated by increased income and improved infrastructure such as transportation systems, agriculture systems and markets. The higher income, place of residence and improved infrastructure are equivalent to higher purchasing capacity which facilitates the consumption of pulses containing larger amounts of fiber, a small amount of dietary fat, a high level of plant proteins and a low glycaemic index. The finding in the current study is consistent with those reported by previous studies [43-47]. This means that the consumption of pulses (legumes, nuts and oily seeds) is important in the management of overweight and obesity, although it should be connected with vigorous physical activities, vegetables and fruit consumption [45].

4.3. Strength and Limitations

This was one of the few studies to explore the prevalence of overweight and obesity and associated lifestyle patterns in rural and urban areas in Tanzania. Thus, the findings may provide baseline information for public health practitioners to design and implement evidence-based interventions across the country to improve lifestyle patterns such as performance of vigorous physical activities and dietary habits. The limitations of this study include the cross-sectional study design which captures data at a single point in time, making it difficult to establish a causal relationship between dependent and independent variables. Also, the time of one week used to assess dietary habits and physical activity patterns was not enough to capture if those are their usual patterns and since this was part of a project, it could be used to comment on looking for a room to record project-respondents information on a certain key aspect providing. Additionally, focus on one district representing urban and one district representing rural residents restricts the generalizability of the findings to other regions with different socioeconomic, cultural and environmental contexts.

5. Conclusion

The study findings indicate a high prevalence of over-

weight and obesity, which may increase the risk of developing diet-related non-communicable diseases in the study areas. The factors associated with overweight and obesity were demographic characteristics, which included place of residence, female sex, level of education, and income. The lifestyle factors associated with overweight and obesity were vigorous-intensity activities, the consumption of at least 290g of pulses (legumes, nuts, and oily seeds) per day and spending <75 minutes per week in vigorous-intensity activities. The results from this study allow us to understand the current situation of overweight and obesity in urban and rural areas and their associated factors. This serves as a benchmark for planning further studies aiming at reducing the prevalence of overweight and obesity among the adult population through well-designed interventions.

6. Recommendations

Overweight and obesity increases the risk of diet-related non-communicable diseases. Increases in these diseases overwhelm and cause limited resources that are used to address them instead of directing efforts to developmental activities. Hence early identification and prevention of overweight and obesity is a necessary, cost-effective means of avoiding the high cost of a treatment-based approach toward non-communicable diseases. It is therefore envisaged that these findings will assist stakeholders in the health sector to introduce nutrition education and counseling, and assessment of client-nutrition status among adults as well as other age groups to allow the design of appropriate interventions.

Abbreviations

BMI	Body Mass Index
DHS-MIS	Demographic Health Survey and Malaria Indicator Survey
FM	Fat Mass
WHR	Waist Hip Ratio
NCDs	Non-communicable Diseases
WHO	World Health Organization

Acknowledgments

The authors would like to thank the adults in Ilala City and Mkuranga district for their voluntary participation in the study. To council authorities in Ilala and Mkuranga for granting permission to conduct the study in their areas. Appreciations are also conveyed to the FoCo Active project for financing this study and for using the FoCo Active project participants for data collection.

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Funding

The FoCo Active project – Sokoine University of Agriculture, Tanzania, financially supported data collection activity.

Conflicts of Interest

The authors declare no conflicts of interest.

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