Original Article

Mugali et al. *JAEP Health Sciences*. 2026; 1(1):e0000002
https://doi.org/10.67650/jaephs.e0000002
eISSN: 3136-3067

JAEP Health Sciences

OPen Access Research

Prevalence of Overweight and Obesity and associated Factors among Patients attending Primary Health Centres in Nyaruguru District, Rwanda.

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Abstract

Background: Overweight and obesity are increasing global public health challenges, with more than 650 million adults affected worldwide. Their prevalence is rising rapidly in both developed and developing countries, contributing to significant health, social, and economic burdens. In Rwanda, limited research has examined the prevalence and determinants of overweight and obesity among rural populations. Understanding the magnitude and associated factors is essential for developing effective prevention strategies. This study aimed to determine the prevalence of overweight and obesity and identify associated factors among adults attending primary health centers in Nyaruguru District, Rwanda.

Methods: A cross-sectional health facility-based study was conducted among adults aged 18 years and above attending selected health centers in Nyaruguru District. A sample of 390 participants was determined using Yamane's formula and selected through stratified sampling. Data were analyzed using SPSS version 28. Chi-square tests and logistic regression were used to identify factors associated with being overweight and obesity, with statistical significance set at $p < 0.05$.

Results: Based on BMI classification, 73.6% of participants had normal weight, 18.7% were overweight, and 7.7% were obese. Similar patterns were observed using other anthropometric indices. Multivariate analysis showed that age above 55 years (AOR=6.56), being married (AOR=3.23), family history of diabetes (AOR=2.26), participants consuming 3–7 alcoholic drinks per week (AOR=3.36, 95% CI: 1.68–6.72, p=0.001).And frequent consumption of sweet drinks (AOR=3.57) were significantly associated with overweight and obesity. Lack of fruit consumption (AOR=2.13, p=0.003) and lack of vegetable consumption (AOR=2.41, p=0.001) were also significant risk factors.

Conclusion: Overweight and obesity are notable health concerns among rural adults in Nyaruguru District. Lifestyle factors, dietary habits, and age significantly influence their occurrence. Strengthening community health education, promoting healthy diets, and encouraging physical activity are recommended to reduce overweight and obesity in rural populations.

Keywords: Prevalence, Factor, Overweight, Obesity.

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Received: Mar 13, 2026, **Revised:** May 18, 2026,
Accepted: May 19, 2026, **Published:** June 7, 2026.

INTRODUCTION

Overweight is a significant public health concern, with its prevalence rapidly rising worldwide in both developing and developed nations. Currently, 650 million adults are obese worldwide, and that number is rising. According to statistics, 167 million people will be unhealthy by 2025 because of being overweight and obese (WHO, 2022). According to World Health Organization (WHO), obesity and several well-known NCDs is the most severe non-infectious epidemic in recorded history (WHO, 2022).

Globally, a minimum of 2.8 million individuals lose their lives annually due to overweight or obesity-related complications. Additionally, approximately 35.8 million people, which accounts for 2.3% of global DALYs (Disability-Adjusted Life Years), are attributed to overweight or obesity. These conditions have detrimental effects on metabolic factors such as blood pressure, cholesterol levels, triglycerides, and insulin resistance (WHO, 2018). Both men and women who are overweight or obese face a heightened susceptibility to a range of non-communicable diseases and metabolic factors such as blood pressure, cholesterol levels, triglycerides, and insulin resistance (Ejigu & Tiruneh, 2023). Obesity is influenced by multiple risk factors, encompassing genetic, biological, social, and environmental elements. These factors influence weight gain by influencing energy intake and expenditure (Lee et al., 2019).

Obesity, a harmful health condition, can adversely affect individuals' physical and mental well-being and is strongly associated with various negative health outcomes (Brouwers, 2016). The presence of metabolic complications related to obesity significantly amplifies the chances of developing type 2 diabetes, hypertension, chronic inflammation, and cardiovascular diseases (Benetolo et al., 2019).

In developing countries including Rwanda, the prevalence of overweight is rising faster than in developed countries as showed in a recent analysis of information from 32 Sub-Saharan African countries revealed that the combined prevalence and factors of overweight in the region were 15.9% for women and 15.6% for men (Manishimwe et al., 2025).

The rising obesity rates in developing countries have been largely attributed to the processes of urbanization and nutrition transitions that have taken place in these communities (Congdon, 2019).The process of nutrition transition is typically linked to a rise in the feeding of energy-dense nutrients that are low fiber and high in sugar, as well as an increased intake of sweetened beverages. Furthermore, it entails a decline in levels of physical activity and a transition towards a lifestyle characterized by less physical exercise, sports and more periods spent in a seated or inactive position (WHO, 2019). The prevention of overweight and obesity is acting early, even before conceiving a baby, better get healthy first (WHO, 2022).

Like numerous other developing nations, Rwanda is currently experiencing an epidemiological transition (Forno, 2017). The nation has not made any progress toward meeting the aim of reducing obesity as well as overweight, which was estimated at 11.5% of adult women, which shows a big number and about 2.5% of adult men with the condition. Rwanda has a low level of obesity as shown by the prevalence, which is lower than the regional average of 20.7% for adult women and 9.2% for men.

To substantiate this, a research investigation carried out by Mukabutera et al. (2016) indicated a surge in the number of obese adult women in Rwanda between the years 2000 and 2010. According to a recent Rwanda Demographic and Health Survey (RDHS), overweight or obesity rates in women in Kigali has reached 34%, and there has been a rise in overweight or obesity among women in all

provinces from 2015 to 2020. Notably, the city of Kigali exhibited the most significant occurrence of overweight or obesity, reaching 42.6% in 2020 (RDHS, 2022). Moreover, a report done by Knoema in 2022 about Rwandans overweight from 1999 to 2016 shows that Rwanda has a 1.9% male overweight prevalence rate in 2016. Male overweight prevalence in Rwanda significantly increased between 1997 and 2016 from 0.5 to 1.9%, climbing at an increasing yearly rate that peaked at 20.00% in 1999 before declining to 5.56% in 2016 (Knoema, 2022).

Therefore, being overweight and obese poses health risks and potential impacts on the social and economic wellbeing of individuals and the country. Despite being a serious health, social and economic problem globally, there is a scarcity of research conducted on the prevalence and contributing factors of overweight among rural adults in Rwanda.

As an illustration, Kigali recorded a substantial prevalence of overweight, with 20.7% among women and 9.2% among men (Mukabutera et al., 2016) but data from rural areas are still missing. To this end, effective measures to fight against overweight cannot effectively be developed without valid statistics showing the occurrence of overweight issues in rural regions. Because of this research gap, there is a necessity for further investigation.

Consequently, the general aim of this study is to evaluate the prevalence of overweight and obesity and identify their associated factors among adults attending primary healthcare centers in the Nyaruguru District, Southern Province, Rwanda. This study contributed to the existing body of knowledge on overweight and obesity by providing empirical evidence from a rural population in Rwanda, a setting where limited data previously existed. Unlike many previous studies that mainly focused on urban populations, this research highlighted the prevalence of obesity and associated lifestyle, socio-demographic, and medical factors influencing overweight and obesity among adults attending primary health centres in Nyaruguru District.

The add value of this study to the science

This study:

- Provides robust, context-specific epidemiological evidence on the burden and determinants of overweight and obesity in a rural Rwandan population, addressing a critical data gap in settings underrepresented in current obesity research.
- Integrates multiple anthropometric indices and lifestyle factors, it strengthens the scientific basis for tailoring non-communicable disease prevention strategies to rural primary healthcare contexts in low- and middle-income countries.

METHODS

Study design

A health facility-based cross-sectional study using a quantitative approach was conducted among adults attending selected primary health centres in Nyaruguru District, Southern Province, Rwanda, in March 2024.

Study population and setting

The study population consisted of 15,300 adult patients attending the 16 selected primary health centers in Nyaruguru District every month. The study targeted adults aged 18 years and above who attended the selected health facilities during the study period. These participants represented rural community members seeking healthcare services in primary healthcare facilities within the district

The study was conducted in Nyaruguru District, located in the Southern Province of Rwanda, and involved 16 selected primary health centres within the district. Nyaruguru is predominantly a rural district where the majority of the population depends on agriculture and informal economic activities for livelihood. The selected health centres provide primary healthcare services to a large rural

population, with an estimated monthly attendance of about 15,300 patients across all facilities.

Inclusion criteria

The study included adults aged 18 years and above who were attending the selected primary health centers in Nyaruguru District during the study period. Participants were required to have resided in Nyaruguru District for at least six months and to provide informed consent before participation in the study.

Exclusion criteria

The study excluded individuals below 18 years of age, pregnant and lactating women, and adults who were seriously ill or mentally unfit during the data collection period. Participants who declined to provide informed consent were also excluded from the study.

Sample size and sampling

The sample size was determined using Yamane's formula for finite populations whereby $n = N / [1 + N (e^2)]$.As n represents the required sample size, N represents the target population, and e represents the margin of error. Using a monthly population of 15,300 adult patients attending the selected health facilities, a 95% confidence level, and a margin of error of 5% (e = 0.05), the calculated sample size was approximately 390 participants. A small allowance for non-response was considered during participant recruitment to ensure achievement of the required sample size. Stratified random sampling was used to select study participants. The 16 health centers constituted the sampling strata. The total sample size was proportionally allocated to each health facility based on average monthly patient attendance. Within each facility, daily outpatient attendance registers of eligible adults served as the sampling frame, and participants were selected using simple random sampling until the allocated sample size for each health center was attained.

The dependent and independent variable of this study

The dependent variable in this study was overweight and obesity status among adults attending primary health centers in Nyaruguru District. Overweight and obesity were assessed using several anthropometric indices, including Body Mass Index (BMI), Waist Circumference (WC), Waist-to-Hip Ratio (WHR), Waist-to-Height Ratio (WHtR), Body Roundness Index (BRI), and A Body Shape Index (ABSI). BMI was calculated as weight in kilograms divided by height in meters squared (kg/m^2) and classified according to the World Health Organization (WHO) criteria as normal weight (18.5–24.9 kg/m^2), overweight (25.0–29.9 kg/m^2), and obesity (≥30 kg/m^2). Waist Circumference (WC) was classified using WHO cutoff points, where abdominal obesity was defined as WC >102 cm for men and >88 cm for women. Waist-to-Hip Ratio (WHR) was calculated by dividing waist circumference by hip circumference, with central obesity defined as WHR >0.90 cm for men and >0.85 cm for women according to WHO standards. Waist-to-Height Ratio (WHtR) was calculated by dividing waist circumference by height, and values greater than 0.5 cm were considered indicative of increased cardiometabolic risk. Body Roundness Index (BRI) and A Body Shape Index (ABSI) were calculated using established published equations based on height, weight, and waist circumference Measurements. The independent variables included socio-demographic characteristics such as age, sex, marital status, education level, occupation, and wealth index. Lifestyle and behavioral factors assessed included alcohol consumption, smoking status, fruit and vegetable intake, sweet drink consumption, processed food intake, sedentary behavior, and family history of chronic diseases such as diabetes, hypertension, stroke, and heart disease.

Study instruments

In this study, a structured questionnaire was utilized as a research instrument to collect relevant information. The questionnaire was designed for the participants in the selected health center in Nyaruguru District. The questionnaire comprises four sections. Section 1 contains the demographic characteristics of the respondents (gender, age, marital status, and education level). Section two contains questions on socio-economic status (income, asset ownership, means of transportation). Section three deals with medical history (such as diabetes, hypertension, etc) and section four covers lifestyle behaviors including smoking, alcohol use and low level of physical activity and diet intake. In addition, the researcher collected anthropometric measurements, including height, weight, waist, and hip measurements.

Validity and reliability of the instrument

The validity of the research instrument was ensured through expert review by the supervisors and alignment of all questionnaire items with the study objectives and relevant literature. Content validity was strengthened by ensuring that the tool adequately covered socio-demographic, clinical, and lifestyle variables related to overweight and obesity. The instrument was pre-tested in a similar setting to identify unclear or ambiguous questions and make necessary adjustments before the actual data collection. Reliability was ensured using a pilot study and test–retest approach, and internal consistency was confirmed using Cronbach's alpha coefficient of ≥0.70, indicating acceptable reliability for the study.

Data analysis procedure

All statistical analyses were performed using the Statistical Package for Social Sciences (SPSS) version 28. Descriptive statistics were used to summarize continuous variables using means and standard deviations, while categorical variables were presented using frequencies and percentages. Overweight and obesity were defined using Body Mass Index (BMI), where overweight was classified as BMI of 25.0–29.9 kg/m² and obesity as BMI ≥30.0 kg/m², according to the World Health Organization (WHO) classification.

The Chi-square test was used for bivariate analysis to examine the association between independent variables and overweight/obesity. Variables that showed a statistically significant association at the bivariate level were entered into a binary logistic regression model to identify independent predictors of obesity and obesity. Adjusted odds ratios (AOR) with 95% confidence intervals (CI) were used to measure the strength of association and a p-value < 0.05 was considered statistically significant.

RESULTS

As shown in Table 1, 52.3% of the participants were males and 47.7% were females. The 18-24 years old dominated other groups with 29.2%. The mean age of the participants is 34.6 and the standard deviation is 1.4. About 43.3% of the participants were married. About one-third of the participants had no formal education (35.6%) and 31% were farmers. About 42.3% of the participants reported not having house effects: a radio or transistor, a television, a mobile phone or a non-mobile phone, a refrigerator, a stove, a watch/clock while 35.4% had some of these items and 22.3% had all the items. The participants of the middle class dominated other groups with 37.7%. The participants who have no means of transport dominated other groups with 64.1%. The participants who possessed land represented 67.4% while those who possessed animals represented 64.9% (Table 1).

Tables 1. Characteristics of rural population attending primary health centres in Nyaruguru District, 2024.

Variables: (n=390)	Frequency	Percentage
Age in years		
18-24	114	29.2
25-34	87	22.3
35-44	69	17.7
45-54	57	14.6
>=55	63	16.2
Gender		
Male	204	52.3
Female	186	47.7
Marital status		
Single	154	39.5
Married	169	43.3
Widow/Separated/Divorced	67	17.2
Education level		
No formal education	139	35.6
Primary	139	35.6
Secondary	84	21.5
University	28	7.2
Occupation		
Student	111	28.5
Unemployed	103	26.4
Civil servant	6	1.5
Self employed	41	10.5
Domestic worker	8	2.1
Farmer/Labourer	121	31.0
Wealth index[1]		
Poorest	80	20.5
Poor	116	29.7
Middle	147	37.7
Rich	31	8.0
Richest	16	4.1
Transport		
No means	250	64.1
Bicycle/Motorcycle	102	26.2
Car	38	9.7
Land ownership		
No	127	32.6
Yes	263	67.4
Animal ownership		
No	137	35.1
Yes	253	64.9

Legend:[1] The richest = possess 6-7 items/7; The rich= possess 5 items/7; The middle=possess 4 items/7; The poor=possess 3 items/7; The poorest=possess 0-2 items/7

Source: Primary data, 2024

Table 2 demonstrates that 31.8% of the respondents reported having a family history of diabetes; 34.4% reported a family history of high blood pressure, 37.7% reported having a family member suffering from stroke while 37.2% reported a family history of heart attack (Table 2).

Table2. Medical history of rural population attending primary health centres in Nyaruguru District, Rwanda 2024.

Variables: (n=390)	Frequency	Percentage
Family history of diabetes		
No	266	68.2
Yes	124	31.8
Family history of HBP		
No	256	65.6
Yes	134	34.4
Family history of Stroke		
No	243	62.3
Yes	147	37.7
Family history of Heart attack		
No	245	62.8
Yes	145	37.2

Source: Primary data, 2024

Table 2 demonstrates that 31.8% of the respondents reported having a family history of diabetes; 34.4% reported a family history of high blood pressure, 37.7% reported having a family member suffering from stroke while 37.2% reported a family history of heart attack (Table 2).

Table 3. Lifestyle behaviour and diet of patients attending primary health centres in Nyaruguru District, Rwanda 2024.

Variables:(n=390)	Frequency	Percentage
Smoking		
Never used tobacco	195	50.0
Former tobacco user	97	24.9
Current tobacco user	98	25.1
Alcohol consumer		
Yes	220	56.4
No	170	43.6
Alcohol		
Rarely (Less than 4 drinks per month)	174	44.6
1-2 drinks per week	87	22.3
3-7 drinks per week	51	13.1
8-14 drinks per week	52	13.3
15 or more drinks per week	26	6.7
Sweet drink		
Less than 3 per week	162	41.5
4-10 per week	82	21.0
11-15 per week	42	10.8
16-20 per week	26	6.7
21-25 per week	48	12.3
26 or more per week	30	7.7
Fruits		
Yes	218	55.9
No	118	30.3
I don't eat fruits	54	13.8
Vegetables		
Yes	207	53.1
No	123	31.5

Variables:(n=390)	Frequency	Percentage
I don't eat fruits	60	15.4
Processed food		
Always	101	25.9
Sometimes	112	28.7
Never	177	45.4
Sedentary behaviour		
No sedentary behavior	135	34.6
Less than 2 hours	153	39.2
More than 2 hours	102	26.2

Source: Primary data, 2024

As shown in Table 3, the study included a total of 390 participants and showed varied behavioural risk factor patterns. Regarding tobacco use, 195 (50.0%) had never used tobacco, 97 (24.9%) were former users, and 98 (25.1%) were current users. For alcohol consumption, 220 (56.4 %) reported consuming alcohol while 170 (43.6%) did not, and among consumers 174 (44.6%) drank rarely (less than 4 drinks per month), 87 (22.3%) consumed 1–2 drinks per week, 51 (13.1%) consumed 3–7 drinks per week, 52 (13.3%) consumed 8–14 drinks per week, and 26 (6.7%) consumed 15 or more drinks per week. Sweet drink consumption was also common, with 162 (41.5%) consuming less than 3 per week, while 82 (21.0%) consumed 4–10, 42 (10.8%) consumed 11–15, 26 (6.7%) consumed 16–20, 48 (12.3%) consumed 21–25, and 30 (7.7%) consumed 26 or more per week. In terms of diet, 218 (55.9%) reported fruit consumption while 118 (30.3%) did not and 54 (13.8%) did not eat fruits at all, while 207 (53.1%) consumed vegetables compared to 123 (31.5%) who did not and 60 (15.4%) who did not eat vegetables. Among the 390 study participants, nearly half (45.4%) reported never consuming processed foods, while 28.7% consumed them sometimes and 25.9% reported always consuming processed foods, indicating varying levels of exposure to processed dietary products within the study population.Finally, sedentary behaviour was reported as none among 135 (34.6%), less than 2 hours per day among 153 (39.2%), and more than 2 hours per day among 102 (26.2%), indicating that a significant proportion of participants were exposed to multiple modifiable lifestyle risk factors (Table 3).

Table 4: Prevalence of overweight and obesity among adult patients attending health centers in Nyaruguru District, Rwanda 2024.

(n=390)	Normal			Overweight			Obese		
Variable	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
BMI	136(47.4)	151(52.6)	287(73.6)	52(71.2)	21(28.8)	73(18.7)	16(53.3)	14(46.7)	30(7.7)
WC	138(46.9)	156(53.1)	294(75.4)	53(72.6)	20(27.4)	73(18.7)	13(56.5)	10(43.5)	23(5.9)
WHR	134(46.9)	152(53.1)	286(73.3)	53(70.7)	22(29.3)	75(19.2)	17(58.6)	12(41.4)	29(7.4)
WHtR	147(48.8)	154(51.2)	301(77.2)	44(69.8)	19(30.2)	63(16.2)	13(50)	13(50)	26(6.7)
BRI	130(47.4)	144(52.6)	274(70.3)	53(69.7)	23(30.3)	76(19.5)	21(52.5)	19(47.5)	40(10.3)
ABSI	127(47)	143(53)	270(69.2)	57(69.5)	25(30.5)	82 (21)	20(52.6)	18(47.4)	38(9.7)

ABSI, a body shape index; BMI, body mass index; BRI, body roundness index; WC, waist circumference; WHR, waist-to-hip ratio; WHtR, waist-to-height ratio

Source: Primary data, 2024

Table 4 demonstrates that based on BMI, 18.7% were overweight and 7.7% were obese. Using WC, 18.7% were overweight while 5.9% were obese. Based on WHR, 19.2% were overweight while 7.4% were obese.

Using WHtR, 16.2% were overweight while 6.7% were obese. Using BRI, 19.5% were overweight while 10.3% were obese. Using ABSI, 21% were overweight while 9.7% were obese.

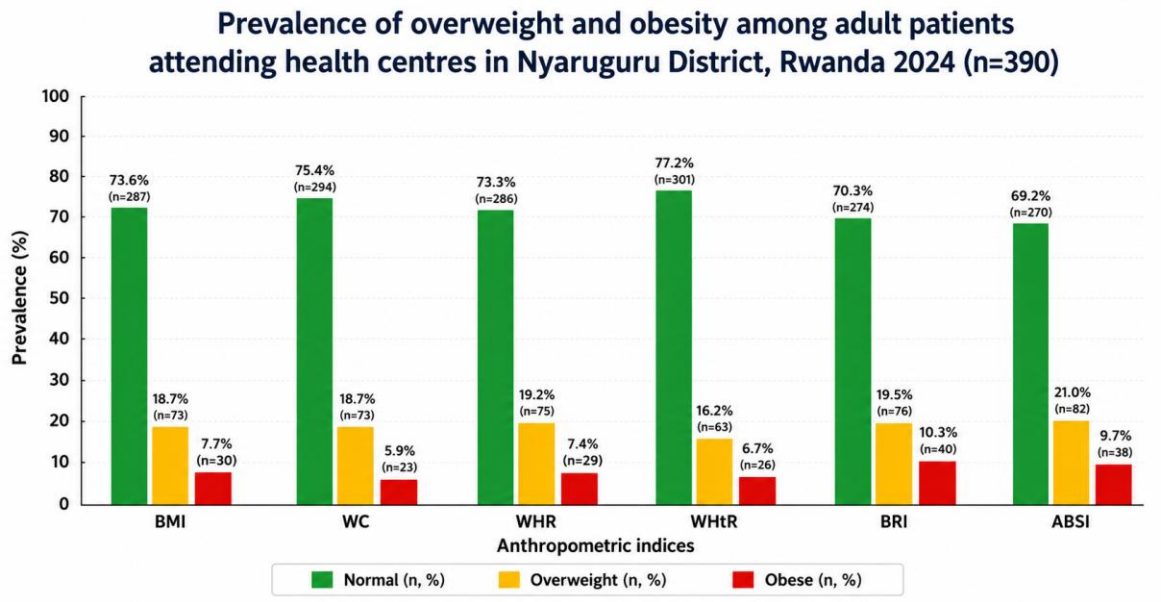

Figure 1. Prevalence of overweight and obesity among adult patients.

The findings of this study as shown in Table 5, demonstrated that several socio-demographic and lifestyle factors were independently associated with the outcome. Increasing age was strongly associated with higher odds compared to the 18–24 reference group, with adjusted odds ratios (AOR) increasing progressively from 25–34 years (AOR = 4.762, 95% CI: 2.010–11.278, p = 0.001), 35–44 years (AOR = 4.000, 95% CI: 1.609–9.942, p = 0.003), 45–54 years (AOR = 4.314, 95% CI: 1.688–11.023, p = 0.002), to ≥55 years (AOR = 6.562, 95% CI: 3.913–15.680, p = 0.001), indicating a clear dose–response relationship. Married (AOR = 3.232, 95% CI: 1.829–5.713, p = 0.001) and divorced/widowed participants (AOR = 3.059, 95% CI: 1.522–6.147, p = 0.003) had significantly higher odds compared to singles, while having a family history of diabetes was also a significant predictor (AOR = 2.263, 95% CI: 1.405–3.646, p = 0,002. Regarding lifestyle factors, overall alcohol consumption was not significant (p = 0.223), but specific drinking patterns such as 1–2 drinks per week (AOR = 2.346, p = 0.006) and 3–7 drinks per week (AOR = 3.364, p = 0.001) were significantly associated with higher odds, while other categories showed mixed significance. High sweet drink consumption was significantly associated with increased odds, particularly 11–15 per week (AOR = 3.219, p = 0.002) and 21–25 per week (AOR = 2.868, p = 0.004). Participants reporting irregular or insufficient fruit consumption had significantly higher odds of overweight and obesity compared with regular consumers (AOR = 2.125, 95% CI: 1.289–3.501, p = 0.003).

Table 5. Multivariate analysis of factors associated with overweight and obesity among patients attending health centres in Nyaruguru District, Rwanda 2024.

Variables(n=390).	COR	AOR	95% C.I		P-value
			Lower	Upper	
Age					
18-24	Ref.	Ref.			
25-34	5.124	4.762	2.010	11.278	**0.001**
35-44	4.721	4.000	1.609	9.942	**0.003**
45-54	5.014	4.314	1.688	11.023	**0.002**
>=55	7.242	6.562	3.913	15.680	**0.001**
Marital Status					
Single	Ref.	Ref.			
Married	3.781	3.232	1.829	5.713	**0.001**
Divorced/widower	3.638	3.059	1.522	6.147	**0.003**
Family history of diabetes					
No	Ref.	Ref.			
Yes	2.673	2.263	1.405	3.646	**0.002**
Consuming alcohol					
No	Ref.	Ref.			
Yes	1.374	1.333	0.840	2.117	0.223
Alcohol					
Rarely (Less than 4 drinks per month)	Ref.	Ref.			
1-2 drinks per week	2.327	2.346	1.277	4.310	**0.006**
3-7 drinks per week	3.551	3.364	1.683	6.723	**0.001**
8-14 drinks per week	1.895	1.738	0.824	3.667	0.147
15 or more drinks per week	2.650	2.317	0.918	5.849	**0.007**
Sweet drink					
Less than 3 per week	Ref.	Ref.			
4-10 per week	2.187	1.918	1.007	3.652	**0.047**
11-15 per week	3.566	3.219	1.519	6.821	**0.002**
16-20 per week	1.471	1.569	0.575	4.283	0.379
21-25 per week	3.274	2.868	1.389	5.924	**0.004**
26 or more per week	2.568	2.242	0.924	5.439	**0.007**
Fruits					
Yes	Ref.	Ref.			
No	2.364	2.125	1.289	3.501	**0.003**
I don't eat fruits	0.627	0.769	0.350	1.690	0.513
Vegetables					
Yes	Ref.	Ref.			
No	2.654	2.409	1.456	3.986	**0.001**
I don't eat vegetables	0.850	0.937	0.447	1.963	0.864
Sedentary behaviour					
No sedentary behavior	Ref.	Ref.			
Less than 2 hours	0.381	0.492	0.269	0.901	**0.021**
More than 2 hours	2.425	2.164	1.240	3.774	**0.007**

Source: Primary data, 2024

Similarly, irregular or insufficient vegetable consumption was significantly associated with overweight and obesity (AOR = 2.409, 95% CI: 1.456–3.986, p = 0.001). However, participants who reported never consuming fruits (AOR = 0.769, p = 0.513) or never consuming vegetables (AOR = 0.937, p = 0.864) did not show statistically significant associations."Sedentary behavior was also a significant predictor, with more than 2 hours

per day increasing odds (AOR = 2.164, p = 0.007), while surprisingly less than 2 hours showed a protective effect (AOR = 0.492, p = 0.021) (Table 5).

Discussions

This study findings revealed the prevalence and factors associated with overweight and obesity among adult patients attending health centres in Nyaruguru District. Overweight and obesity was common in the health centers in Nyaruguru District with 18.7% and 7.7% being overweight and obese, respectively based on BMI. Using WC, 18.7% were overweight while 5.9% were obese. Based on WHR, 19.2% were overweight while 7.4% were obese. Using Waist to Hip Ratio, 16.2% were overweight while 6.7% were obese. Using BRI, 19.5% were overweight while 10.3% were obese. Using ABSI, 21% were overweight while 9.7% were obese. These findings were lower than those reported in Uganda (Nalugga et al., 2022). The plausible reason for this difference may have been due to the nature of the participants. The Uganda study was conducted among individuals living with HIV/AIDS (PLWH) visiting referral hospitals in Kampala, Uganda. It is known that the medications for HIV for those on ART predisposes them to weight gain (Bailin et al., 2020).

The present study's findings are similar to those found by Mukabutera et al. (2016) in Rwanda. Their study was conducted in Rwanda and examined the trends and prevalence of overweight among women, along with the socio-demographic factors linked to these conditions. The analysis revealed an increase in the prevalence of overweight and obesity among women from 13% in 2000 to 16.5% in 2010. The highest rates were observed in Kigali City (35%) and other urban areas (31.5%) in 2010 (Mukabutera et al., 2016). The reason for this similarity might be due to the regions concerned. The two studies were conducted in Rwanda where life conditions are almost the same. Concerning lifestyle factors associated to overweight and obesity, the present study found that consuming 3-7 drinks of alcohol per week was three times more likely associated with overweight and obesity, AOR 3.364 95% CI (1.683-6.723), p<=0.001. Consuming 11-15 drinks of sweet drinks per week was three times more likely associated to overweight and obesity, AOR 3.566 95% CI (1.519-6.821), p<=0.001. Not consuming fruit was two times more likely associated to being overweight and obesity, AOR 2.364 95% CI (1.289-3.501), p<=0.003. Not consuming vegetables was two times more likely associated to being overweight and obesity, AOR 2.409 95% CI (1.456-3.986), p<=0.001. Having sedentary behaviour of more than 2 hours a day was two times more likely associated to overweight and obesity, AOR 2.164 95% CI (3.774-1.240), p<=0.007. These results are similar to those found by Baillot et al. (2021).

Similarly, Tesfaye et al. (2020) found the same findings in Ethiopia. Indeed, the Ethiopia study found that dietary diversity and physical exercises were determined to be risk factors for abdominal obesity in adults.

Study Limitations

The findings of this study should be interpreted in light of several limitations. First, the cross-sectional design limited the ability to establish temporal and causal relationships between the identified risk factors and overweight/obesity outcomes, as exposure and outcome variables were assessed simultaneously (Savitz & Wellenius, 2022). Second, some variables, particularly dietary practices and lifestyle behaviors, were based on self-reported information, which may have introduced recall and social desirability bias among participants (Serban et al., 2022). In addition, the study was conducted among adults attending selected primary healthcare centers in Nyaruguru District, which may limit the generalizability of the findings to the wider Rwandan population or other rural settings. Nevertheless, the study provides valuable epidemiological evidence on overweight and obesity in rural Rwanda and offers an important

basis for future longitudinal studies and context-specific public health interventions

Study Implications

The findings of this study have important policy implications for Rwanda's response to the growing burden of overweight and obesity in rural areas, where prevention efforts have traditionally focused on under nutrition. The observed associations between excess body weight and modifiable lifestyle factors support the integration of obesity prevention into existing primary health care and community-based programs under Rwanda's National Non-Communicable Diseases (NCD) Strategic Framework. Strengthening routine anthropometric screening, nutrition education, and physical activity promotion at health centres and through community health workers can support early identification and prevention in rural populations. These results provide evidence to inform policy refinements that ensure rural communities are fully included in national strategies addressing overweight, obesity, and related NCDs (Rwanda Ministry of Health, 2021; World Health Organization, 2018).

Conclusion

This study found a high prevalence of overweight and obesity among adults attending primary health centers in Nyaruguru District, Rwanda, indicating an increasing burden of non-communicable disease risk factors within the population. The findings revealed that socio-demographic factors such as increasing age, marital status, and family history of diabetes were significantly associated with overweight and obesity. In addition, behavioral and lifestyle-related factors including frequent alcohol consumption, high intake of sweet drinks, irregular or insufficient fruit and vegetable consumption, and prolonged sedentary behavior were identified as important predictors of overweight and obesity. These findings highlight the need for comprehensive public health interventions focusing on nutrition education, promotion of healthy dietary practices, reduction of sedentary lifestyles, and early screening of high-risk individuals at primary healthcare level to prevent the growing burden of overweight, obesity, and related chronic diseases in Rwanda.

Acknowledgements

The researcher sincerely acknowledges all participants who willingly participated in this study. Special appreciation is extended to the management and staff of the selected health centres in Nyaruguru District for their cooperation and support during data collection. The researcher also thanks the supervisors and data collectors for their valuable guidance, encouragement, and technical assistance throughout the study.

Author Contributions

"AM conceptualized and designed the study, collected and analysed the data, interpreted the findings, and drafted the manuscript. "MAG and JCN supervised the research process, reviewed the manuscript critically for academic content, and approved the final version of the thesis.

Funding

This study did not receive any financial support from governmental, private, or non-governmental organizations. The research was fully supported by the researcher.

Data availability

The datasets used and analysed during the current study are not publicly available due to confidentiality and privacy considerations of the participants. However, the data may be obtained from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki and received ethical approval from the Mount Kenya University Ethical Committee under reference number **MKU04/PGS&R/1137/2023**. Participation in the study was entirely voluntary, and written informed consent was obtained from all participants before data collection. Participants were informed about the purpose of the study, procedures involved, potential risks and benefits, confidentiality measures, and their right to withdraw from the study at any stage without any consequences. The study involved minimal risk since only interviews and non-invasive anthropometric measurements were conducted. Although no financial incentives were provided, participants benefited from increased awareness regarding overweight and obesity prevention, healthy lifestyle practices, and early health-seeking behavior. To ensure privacy and protection of personal information, no identifying information such as names or identification numbers was recorded in the dataset. All collected data were securely stored in password-protected files accessible only to the research team and were used strictly for academic and research purposes. Results were reported in aggregate form to maintain participants' anonymity and confidentiality.

Competing interests

The authors declare that they have no competing interests.

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