

Overweight or Obesity prevalence, trends and risk factors among women in Rwanda: A cross-sectional study using the Rwanda Demographic and Health Surveys, 2000–2010

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Abstract

Objectives: Obesity has been a growing concern worldwide and in sub-Saharan Africa in particular. The objective of this study was to explore the prevalence of and secular trends in the rate of being overweight/obese in Rwandan women and the associated socio-demographic risk factors. **Design:** The study involved a secondary analysis of data from the Rwanda Demographic and Health Surveys (RDHSs) conducted in 2000, 2005 and 2010. These are countrywide, cross-sectional household studies conducted every five years. A stratified cluster sampling technique was used. **Setting:** A total of 10,421 women in 2000, 11,539 in 2005 and 12,540 in 2010 participated in the population based household surveys in Rwanda. **Primary outcome measure:** Participants whose body mass indexes were ≥ 25 kg/m² were considered to be overweight/obese. **Results:** The prevalence of woman being overweight/obese increased from 13% in 2000 to 16.5% in 2010. The highest prevalence rates in 2010 were found in Kigali city (35%) and other urban areas (31.5%). Women with higher levels of education and from wealthier households were more likely to be overweight/obese. Using multivariable logistic regression analysis in the full model, the area of residence, wealth, religion and the number of household members were found to be significantly associated with being overweight/obese. In the adjusted model only the first three of these were still associated with a significantly increased risk. **Conclusion:** Being overweight/obese is becoming more common in Rwandan women, especially in those living in urban areas who are wealthy. Being overweight/obese is also associated with being Protestant. The reasons for this association are likely to be complex and require further study. Health awareness campaigns should recognise the importance of over-nutrition, as well as under-nutrition, and should promote healthy diets and the importance of physical activity.

Key words: overweight, obesity, women, Rwanda

Introduction

Obesity in those of childbearing age has become a public health concern worldwide, including low and middle income countries (Kanter & Caballero, 2012). The World Health Organization (WHO) has estimated that there are 1.4 billion people aged 20 years or older who are overweight, and that almost 300 million of these are women (WHO, 2014) in low and middle income countries, where under-nutrition is endemic, obesity is not usually considered to be a public health priority. However, changes in demography mean that the rates of both being overweight and obesity are increasing in low and middle-income countries.

Being overweight or obese is associated with an increased risk of various non-communicable diseases in both men and women (Webber et al., 2014), threatening healthcare systems that are already overburdened by communicable diseases in developing countries (Boutayeb, 2006). In women of childbearing age, obesity and a tendency to be overweight are associated with polycystic ovarian syndrome, which can lead to reproductive dysfunction (Moran, Dodd, Nisenblat, & Norman, 2011).

Food insecurity in Rwanda, as in other developing countries, is a major concern, leading to a focus on under-nutrition. However, recently the efforts of the Rwandan Government have shifted the country from being a poor country towards being a middle-income country. This has been followed by an increase in those who are overweight or obese (Ministry of Health, 2011). However, little is known regarding the rate of the increase or of the causative factors. Understanding the effects of demographic transitions on the body weight of Rwandan women is important for planning and developing evidence-based health policies. The aim of this study was to examine secular trends in the prevalence of

being overweight or obese amongst Rwandan women of childbearing age and to identify the socio-demographic factors impacting on it.

Methods

Data source

The study involved a secondary analysis of the data from the Rwanda Demographic and Health Surveys (RDHSs) 2000, 2005 and 2010. The RDHSs were started in 1992 and are population based, cross-sectional household surveys. They are conducted every five years on nationally representative samples from the households surveyed comprising women aged 15–49 years, men aged 15–59 years and children. The data collected includes information on the health of women and children, including the nutritional status. The present study used the data collected in the surveys conducted between 2000 and 2010 on the heights and weights of women aged 15–49 years. Only the data from the 2010 survey was used to examine risk factors for being overweight/obese.

Study population and sample size

The RDHSs use a multi-stage, stratified sampling method. Firstly, villages (also known as clusters or enumeration areas) are selected, with the probability proportional to the village size. Subsequently, a complete mapping and listing of all the households in the selected villages is conducted. This serves as the sampling frame for the selection of the households to be surveyed. The 2000, 2005 and 2010 surveys included 10,421; 11,539 and 12,540 women, respectively.

For all three years anthropometric measurements were obtained from every woman included in the study.

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Outcome measures

Anthropometric data collected in the surveys was used to calculate the body mass indexes (BMIs) of the participants. BMI was considered to be a continuous variable. It was categorised according to WHO recommendations as follows: underweight, <18.5 kg/m²; normal weight, 18.5–24.9 kg/m²; overweight, 25.0–29.9 kg/m²; and obese, ≥30.0 kg/m². The last two categories were considered together as overweight/obese.

Predictors

The covariates in this study included age, province, residence educational level, religion, number of household members, number of children of 5 years and under, tobacco use, marital status and current breastfeeding status. Wealth index was developed on the basis of de jure population asset data using principal components analysis.

Statistical analysis

A univariate analysis was performed to determine summary statistics of selected variables. The prevalence and trends of being overweight/obese by area of residence and stratified by year were described. Chi-square tests were used to assess the associations between being overweight/obese and socioeconomic and demographic factors. After bivariate analysis, we retained for consideration in a multivariable model the variables associated with being overweight/obese with P values <0.1. We included all potential predictors in the full model and removed them using backward-stepwise regression, retaining those that were significant at a level of P < 0.05.

The analysis was carried out using the STATA statistical software package (StataCorp. 2007. Stata Statistical Software: Release 13. StataCorp LP, College Station, TX, USA), using survey commands to account for the complex sample design. Probability weights were applied to all observations to account for oversampling of urban Primary Sampling Units (PSUs), and confidence intervals accounted for clustering and stratification. The significant level was set at P < 0.05, with 95% confidence intervals (CI).

Ethical issues

Approval to access the database was obtained through online registration to DHS Macro. The data were treated as confidential, with no efforts being made to track back individual participants.

The Rwanda National Ethics Committee and the National Institute of Statistics approve the RDHSs

Results

The prevalence of being overweight/obese increased between 2000 and 2010, both in urban and rural areas (Fig.1). Nationally, it was 13%, 12% and 16.5% in 2000, 2005 and 2010, respectively. It was particularly high in urban areas such as Kigali.

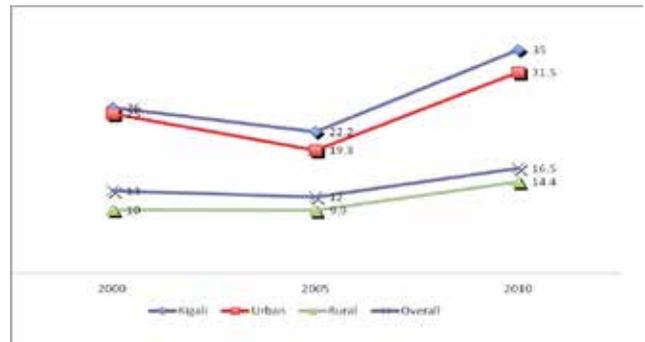


Figure 1. Prevalence and trends of being overweight/obese among Rwandan women, 2000–2010

Detailed socioeconomic, demographic and other data regarding the participants in the 2010 survey are given in Table 1. Of the 4179 women included, 44% had given birth to four or more children, 88% lived in rural areas and 71% were under 35 years old. With regards to education, 19% had received no formal education, 72% had completed primary school and 9% had completed secondary school. A majority (82%) were Christians (such as protestant, catholic, Adventist,); nearly all of the remainder were Muslims. Most (85%) were married and almost half (49%) used modern contraceptive methods. Most (79%) were employed, including self-employment.

Table 1. Socioeconomic, demographic and household characteristics of participants (N= 4179)

Variables	n	%	Variables	n	%
Age			Number of children ever born		
15–24	754	18.04	One	642	15.36
25–34	2230	53.36	Two	862	20.63
35–49	1195	28.60	Three	716	17.13
Total	4179		Four	553	13.23
Province			Five	1406	33.64
Kigali city	389	9.31	Total	4179	
South	1013	24.24	Contraceptive use		
West	1024	24.50	No modern contraceptive	2123	50.79
North	691	16.54	Modern contraceptive	2056	49.21
East	1062	25.41	Total	4180	
Total	4179		Currently breastfeeding		
Residence			No	952	22.78
Urban	499	11.94	Yes	3227	77.22
Rural	3680	88.06	Total	4179	
Total	4179		Marital/Relationship status		
Educational level of mother			Single	263	6.29
No education	799	19.11	Married	3541	84.71
Primary	3004	71.89	Not in union	375	9.00
Secondary and Higher	376	9.00	Total	4179	
Total	4179		Tobacco use		
Religion			Nil	3973	95.07
Catholic	1715	41.10	Cigarettes	13	0.31
Protestant	1688	40.45	Pipe	36	0.86
Adventist	631	15.12	Chewing	94	2.25
Muslim	55	1.32	Snuff	63	1.51
Others, including no religion and Jehovah's witnesses	84	2.01	Total	4179	
Total	4173		Employment		
Number of household members			No	878	21.02
0–4 members	657	15.72	Yes	3298	78.98
4+ members	3522	84.28	Total	4176	
Total	4179				
Number of children 5 years old and younger in household					
0–2 children	3645	87.22			
3+ children	534	12.78			
Total	4179				
Wealth index					
Poorest	936	22.39			
Poorer	923	22.08			
Middle	852	20.41			
Richer	795	19.02			
Richest	673	16.10			
Total	4179				

The relationships between being overweight/obese and socioeconomic and demographic variables are shown in Table 2. Being overweight or obese was most common in the following groups: those aged 25–34 years; Protestants; those with three or more children; those without a partner; and non-breastfeeding. In addition, being overweight/obese tended to increase with increasing wealth.

Table 2. Proportion of women who are overweight/obese (BMI > 25 kg/m²) by background characteristics of participants (n=4179)

Variable	N	No. overweight/obese n	overweight/obese %	95% CI	P value
Overall	4179	688	16.5		
Woman's age					
15-24	754	123	16.3	13.4-19.7	0.396
25-34	2230	385	17.3	15.1-19.7	
35-49	1195	179	15	12.7-17.7	
Province					
Kigali city	389	136	35	29.6-40.7	0.000
South	1013	105	10.4	8.2-13.1	
West	1024	153	14.9	12.0-18.5	
North	691	106	15.3	11.7-19.8	
East	1062	187	17.6	14.8-20.8	
Residence					
Urban	499	157	31.5	26.9-36.5	0.000
Rural	3680	530	14.4	12.9-16.1	
Mother's education					
No education	799	122	15.2	12.1-18.9	0.000
Primary	3005	449	14.9	13.3-16.7	
Secondary and Higher	376	117	31.3	25.8-37.3	
Religion of woman					
Catholic	1715	240	14	11.9-16.4	0.045
Protestant	1688	315	18.6	16.2-21.3	
Adventist	631	104	16.5	13.1-20.6	
Muslim	55	14	25.1	14.9-39.1	
Others: no religion and Jehovah	84	15	18.1	9.3-32.2	
Number of household members					
0-4 members	657	82	12.5	9.6-16.3	0.026
4+ members	3522	605	17.2	15.6-18.9	
Number of children 5 years and under in household					
0-2 children	3645	577	15.8	14.4-17.4	0.111
3+ children	534	110	20.6	15.1-27.6	
Wealth index					
Poorest	936	94	10.1	1.5-13.3	0.000
Poorer	923	97	10.5	8.1-13.4	
Middle	853	118	13.8	10.9-17.5	
Richer	795	153	19.2	15.8-23.2	
Richest	673	226	33.6	29.5-37.9	
Number of children ever born					
One	642	98	15.2	12.5-18.5	0.865
Two	862	151	17.5	14.2-21.3	
Three	716	110	15.3	11.7-19.9	
Four	553	90	16.2	12.3-21.2	
Five	1406	240	17.1	14.4-20.1	

Table 2. Proportion of women who are overweight/obese (BMI > 25 kg/m²) by background characteristics of participants (n=4179) cont'd

Variable	N	No. overweight/obese	overweight/obese	95% CI	P value
Current type of contraceptive					
No modern contraceptive	2123	340	16	13.9–18.4	0.594
Modern contraceptive	2057	347	16.9	14.9–19.0	
Currently breastfeeding					
No	952	207	21.8	18.8–25.1	0.000
Yes	3228	480	14.9	13.2–16.8	
Marital status					
Single	263	40	15.1	11.0–20.4	0.418
Married	3541	576	16.3	14.7–18.0	
Not in union	376	72	19.2	14.5–24.9	
Tobacco use					
Not smoking	3973	658	16.6	15.0–18.2	0.793
Cigarette	13	2	16.8	2.4–62.6	
Pipe	36	7	19.9	7.9–42.0	
Chewing	94	9	9.7	3.2–26.2	
Snuff	63	11	17	8.0–32.4	
Employment					
No	878	136	15.5	12.4–19.2	0.524
Yes	3298	552	16.7	15.1–18.5	

The results of the multivariate logistic regression analysis are shown in Table 3. In the full model, the area of residence, wealth, religion and the number of household members were found to be significantly associated with being overweight/obese. In the adjusted model, only the first three of these were still associated with a significantly increased risk.

Table 3. Multivariable logistic regression analysis of the correlations of being overweight or obese

Variables	Full model				Adjusted model			
	OR ^a	95% CI ^b		P value	OR ^a	95% CI		P value
Woman's age								
15–24	1							
25–34	1.03	0.76	1.38	0.867	-	-	-	-
35–49	0.85	0.61	1.19	0.341	-	-	-	-
Mother's education								
No education	1							
Primary	0.87	0.63	1.18	0.36	-	-	-	-
Secondary and Higher	1.16	0.77	1.76	0.475	-	-	-	-
Province								
Kigali city	1							
South	0.59	0.36	0.96	0.035	-	-	-	-
West	0.84	0.51	1.36	0.473	-	-	-	-
North	0.89	0.51	1.53	0.665	-	-	-	-
East	0.9	0.56	1.43	0.642	-	-	-	-
Residence								
Urban	1				1			
Rural	0.75	0.51	1.12	0.161	0.68	0.51	0.92	0.012

Table 3. Multivariable logistic regression analysis of the correlations of being overweight or obese cont'd

Wealth index								
Poorest	1				1			
Poorer	1.02	0.67	1.56	0.915	1.07	0.71	1.61	0.747
Middle	1.32	0.86	2.01	0.199	1.46	0.96	2.22	0.077
Richer	1.87	1.22	2.86	0.004	2.06	1.38	3.08	0.000
Richest	2.91	1.84	4.58	0.000	3.75	2.55	5.52	0.000
Religion of woman								
Catholic	1				1			
Protestant	1.3	1	1.68	0.047	1.34	1.05	1.72	0.021
Adventist	1.13	0.8	1.6	0.497	1.16	0.82	1.65	0.386
Muslim	1.13	0.59	2.19	0.707	1.19	0.63	2.23	0.591
Other (no religion and Jehovah)	1.26	0.54	2.96	0.587	1.38	0.59	3.21	0.459
Number of household members								
0-4 members	1				1			
4+ members	1.46	1.04	2.05	0.029	1.4	0.99	1.96	0.054
Currently breastfeeding								
No	1							
Yes	0.79	0.61	1.03	0.087	-	-	-	-

^aOR = odds ratio, ^bCI = Confidence Interval

Discussion

Our study showed that there was an increase in numbers of overweight/obese women in Rwanda in the decade from 2000 to 2010. This was seen in women from both urban and rural areas, although the increase was greater in urban areas where one in three women were overweight or obese.

Currently, problems arising from both under and over-nutrition pose challenges to healthcare systems in developing and middle-income countries and are, in part, a consequence of urbanisation, global nutrition transition and lifestyle changes (Puoane et al., 2002; SK Kapoor, 2002). In Africa, women were disproportionately affected (Puoane et al., 2002). Our findings are concordant with those reported by the Rwanda Ministry of Health in 2011 and may be a consequence of the transition from a low- to a middle-income country (Ministry of Finance, 2012).

Being overweight/obese is a particular problem of wealthier urban women. This may reflect their easy access to calorie rich foods and limited physical exercise. Similar findings have been reported from elsewhere in Africa like in Ghana, Kenya, Niger, Malawi, Senegal and others (Abubakari et al., 2008; Kruger et al., 2012; Puoane et al., 2002; Turi, Christoph, & Grigsby-Toussaint, 2013) and from Brazil (Alves, Falcão, Pinto, & Correia, 2011). Wealthier women in urban areas often have household helpers and watch more television which might be limiting their physical activities (Agbeko, 2013).

An interesting finding of our study was the association between being overweight/obese and being Protestant. An association between weight and religion has been reported before (Cline & Ferraro, 2006). The explanation for it is likely to be complex. Some religions, including Protestant, preach that the use of tobacco products and alcohol is sinful. Food and sugary tea may be substituted. Religious cultural pressures may cause many women to consume sugary drinks rather than alcohol, contributing to obesity,

with associated risks to their health (Schulze et al., 2004). Public health interventions, delivered as part of community education, should promote the benefits of healthy diets and regular physical activities (Ettarh, Van de Vijver, Oti, & Kyobutungi, 2013).

Limitations

The RDHSs are cross-sectional studies, collecting data at particular points in time. It is not appropriate to infer causation from them. Moreover, data were not collected on physical activity levels, which are known to be an important factor determining individuals' weights.

Conclusions

This study identified factors associated with being overweight/obese in Rwandan women. We found that the prevalence was highest in those living in urban locations, in those who were wealthy and Protestants. Like under nutrition, over-nutrition should be considered an important health issue. Further studies are required to investigate the link between religious affiliation and weight.

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Conflict of interests

There are none

Authors' contribution

AM and EN were responsible for the design of the study and the data analysis. All the authors contributed to the interpretation of the data, the writing and revisions to the manuscript.

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