Gender and socio-demographic distribution of body mass index: The nutrition transition in an adult Angolan community

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Abstract

This cross-sectional survey with 2357 subjects aged 15 to 64 years from a rural-urban community in Bengo Province, Angola, aimed to evaluate the gender differences in the prevalence of body mass index categories and how socio-demographic characteristics influence it. Women presented a significantly higher prevalence of obesity (10.5% *versus* 2.8%) but the underweight frequency was similar to men (10.2% *versus* 12.4%). Overweight and obesity increased with age, with underweight being more prevalent in the age group 15 to 24 years. Obesity was more prevalent among individuals living with a companion (in a marital relation), decreased with education (in women), but was higher in rural areas, and for those with a higher family monthly income, in both genders. The prevalence of obesity and underweight were similar in women, reflecting a nutrition transition state. Like in other African communities, women present a higher prevalence of overweight and obesity them men, but the values of underweight are similar between genders. This stresses the need of designed health interventions for women, to face the double burden and accumulation of risk factors in women.

Introduction

Overweight and obesity are major public health problems, consistently associated with increased risk of non-communicable diseases (NCD).[1] Between 1980 and 2013 the proportion of adults with overweight and obesity increased worldwide, from 28.8% to 36.9% in men and from 29.8% to 38.0% in women,[2] a phenomenon observed in all regions of the world.[1-5] However, the other extreme of body mass index (BMI), underweight, remains an important social and health threat, associated with increased risk of morbidity and mortality, and it is only slowly decreasing in Africa.[1,6,7]

Sub-Saharan Africa (SSA) faces a demographic and epidemiologic transition.[8-11] Urbanization, sedentary lifestyles and nutritional changes towards westernized diet, high in sugar and fats, led to an increased obesity and NCD prevalence that coexists with the burden of communicable diseases.[8-13] This dual burden presented in national vital statistics also reflect potential inequalities at the level of households, with gender or generation differences in food allocation related to social norms.[10]

Angola faces an increase in premature deaths caused by NCD and high rates of maternal and child mortality due to infectious diseases,[14] as described by the early stage of the nutrition transition.[9] One child in twelve does not survive to the age of five,[15] with malnutrition as an underlying cause of most deaths, with 38.0% of children stunted and 15.6% underweight.[16] However, data on gender, poverty, and health related issues is lacking in the country.[17] In this report, we present the prevalence of BMI categories in 15 to 64 years-old inhabitants of a well-defined community of Angola, evaluating its distribution according to gender and socio-demographic characteristics.

Materials and Methods

The results shown in this paper where extract from a community-based survey conducted in the catchment area of the Dande - Health Demographic Surveillance System (Dande-HDSS), located in the Dande Municipality, in Bengo Province, Angola.[18] A representative sex- and age-stratified random sample of the Dande-HDSS population (60,075 people) was drawn to constitute the baseline of a large prospective survey on cardiovascular risk factors, the CardioBengo.[19] Participants were evaluated following the published protocol,[19] based on the World Health Organization (WHO) STEPwise approach to Surveillance (STEPS) to Chronic Disease Risk Factor manual (core and expanded version 3.0).[20] A total of 2484 individuals (15 to 64 years old) were evaluated between September 2013 and March 2014. We excluded 116 pregnant women due to the fact that anthropometric parameters vary during pregnancy, and 11 individuals with missing data on anthropometric measurements, making the final sample of 2357 individuals.

Demographic and social characteristics

Information on age, completed years of school education, marital status, monthly family income, were collected through a structure interview.[19,20] For analysis, age was categorized into five 10-year age groups: 15 to 24; 25 to 34; 35 to 44; 45 to 54; and 55 to 64 years old. Education was categorized according to the number of completed schooling years as none; 1 to 4 years; 5 to 9 years; 10 years or more. Marital status was classified into three categories: Single, divorced, widower (living alone); Single (living with parents); Married (living with a companion). Monthly family income in kwanzas was converted into United States Dollars (USD) at the currency valid in 2014, and categorized into groups of no income; under or equal to 150 USD; 151 to 299 USD; and greater or equal to 300 USD. The area of residence was classified as rural or urban as previously described.[18]

Anthropometric measurements

Trained interviewers and certified health professionals conducted all anthropometric measurements as described before.[19] BMI was calculated as weight (kg) divided by squared height (m^2), and further categorized according to WHO as underweight (<18.5 kg/m^2), normal (18.5 to 24.99 kg/m^2), overweight (25.0 to 29.99 kg/m^2), and obese ($\geq$30 kg/m^2).[3]

Statistical analysis

Data were double entered into a PostgreSQL® database and imported into SPSS® version 23 (IBM, New York, USA) for statistical analysis. Post-stratification survey weights were calculated using the known sex and categorical age distribution of the Dande-HDSS population,[19] and these were used in all further calculations. Descriptive data are reported as absolute frequencies and percentages, and means and standard deviations when appropriate. Pearson's chi-square test or Fisher's exact test were used to assess the independence of BMI categories and socio-demographic characteristics, with a significance level of P<0.05. Prevalence estimates with a 95% confidence interval (95% CI) were computed for BMI categories by socio-demographic characteristics.

Ethics

This study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects/patients were approved by the Ethics Committee of the Angolan Ministry of Health. Written informed consent was obtained from all subjects/patients (in the case of under 18 years old, their parent or legal guardian).

Results

The study population had a mean age of 32.5 ($\pm$13.6) years, with women (34.4$\pm$13.7 years) older than men (30.5$\pm$13.2 years) with 9.2% being older than 54 years. Approximately one-fifth of the population lived in rural areas and 16.6% of women and 1.4% of men had no formal education, with 51.1% of women having 4 or fewer years of formal education compared to 12.3% of men. The majority of the population (54.5%) reported living accompanied, women living alone (15.9%) more frequently them men (8.6%). Only 14.7% of the population had a monthly family income equal or superior to 300 USD, 56.4% presenting an income inferior to 150 USD, lower for women (Table 1).

The mean BMI was 23.5 ($\pm$4.9) Kg/m^2 in women and 21.8 ($\pm$3.4) Kg/m^2 in men. The overall prevalence of obesity was

Table 1. Socio-demographic characteristics and Body Mass Index Categories, by sex.

	Total (n = 2,357) % (95% CI)*	Female (n = 1,225) % (95% CI)*	Male (n = 1,132) % (95% CI)*	P-Value
Age				
15-24 years	36.2 (34.3-38.1)	30.1 (27.6-32.7)	42.7 (39.9-45.6)	<0.001
25-34 years	25.9 (24.2-27.7)	25.4 (23.0-27.9)	26.5 (24.0-29.1)	
35-44 years	16.1 (14.7-17.6)	18.7 (16.6-20.9)	13.3 (11.5-15.4)	
45-54 years	12.6 (11.3-14.0)	15.3 (13.4-17.4)	9.7 (8.1-11.6)	
55-64 years	9.2 (8.1-10.4)	10.6 (9.0-12.4)	7.8 (6.3-9.5)	
Place of residence				
Urban	81.0 (79.4-82.5)	81.2 (78.9-83.3)	80.8 (78.4-83.0)	0.838
Rural	19.0 (17.5-20.6)	18.8 (16.7-21.1)	19.2 (17.0-21.6)	
Education (n = 2,351)				
None	9.3 (8.2-10.5)	16.6 (14.6-18.8)	1.4 (0.9-2.3)	<0.001
1-4 years	23.1 (21.5-24.9)	34.5 (31.9-37.2)	10.9 (9.2-12.8)	
5-9 years	42.2 (40.2-44.2)	35.7 (33.1-38.5)	49.2 (46.3-52.1)	
>10 years	25.4 (23.7-27.2)	13.1 (11.4-15.2)	38.5 (35.7-41.4)	
Marital Status (n = 2,332)				
Single, divorce, widower (living alone)	12.4 (11.1-13.8)	15.9 (13.9-18.0)	8.6 (7.1-10.4)	<0.001
Single (living with parents)	33.1 (31.2-35.0)	25.1 (22.8-27.7)	41.7 (38.8-44.6)	
Married (living with companion)	54.5 (52.5-56.5)	59.0 (56.2-61.7)	49.7 (46.8-52.6)	
Montly Family Income (n = 1,345)				
No income	8.4 (7.0-10.0)	10.9 (8.8-13.3)	5.3 (3.8-7.3)	<0.001
≤150 USD	48.0 (45.3-50.6)	54.8 (51.2-58.4)	39.6 (35.8-43.6)	
151-299 USD	29.0 (26.6-31.5)	28.0 (24.8-31.3)	30.3 (26.7-34.0)	
≥300 USD	14.7 (12.9-16.7)	6.4 (4.8-8.4)	24.7 (21.4-28.2)	
Body Mass Index Categories (kg/m^2)				
Underweight (<18.5)	11.3 (10.1-12.6)	10.2 (8.6-12.0)	12.4 (10.6-14.5)	<0.001
Normal (18.5-24.99)	66.1 (64.1-67.9)	58.6 (55.8-61.4)	74.1 (71.4-76.5)	
Overweight (25.0-29.99)	15.8 (14.4-17.4)	20.6 (18.4-23.0)	10.7 (9.0-12.6)	
Obese (≥30)	6.8 (5.9-7.9)	10.5 (8.9-12.4)	2.8 (2.0-4.0)	

*Post-stratification weights used as described in the methods section.

6.8%, significantly higher in women (10.5%) than in men (2.8%). The proportion of overweight and obesity was 31.1% (95% CI 28.6, 33.8) in females and 13.5% (95% CI 11.6, 15.6) in males, with the gender prevalence of underweight being similar, 10.2% for females and 12.4% for males (Table 1).

The prevalence of overweight and obesity increased with age, obesity peaking in the age group 35 to 44 years, with 19.7% in females and 7.3% in males; underweight was more prevalent in the age group 15 to 24 years, 18.5% in females and 18.4% in males. Obesity prevalence has higher in urban areas, in both sexes (Table 2).

The prevalence of overweight and obesity decreased with education in women but increased in men. The lowest frequency of overweight and obesity are found among the individuals living with parents, in both sexes. Prevalence of overweight and obesity tended to be highest among participants with a monthly income above 150 USD in both sexes, with underweight higher in females (11.7%) with no income (Table 2).

Discussion

Nationally representative studies of obesity in sub-Saharan Africa are scarce. The studies that are available, though, suggest that obesity rates vary widely from country to country, lacking strong evidence to support further comparisons and an adequate picture of the region, and a first local approach is needed to better design future interventions.

The 6.8% obesity prevalence encounter is lower than the 8.8% estimation made by NCD-RisC for 2014,[6] but similarly higher in females. This lower value that of the national estimates, possibly is due to the fact that the survey region is a tampon to Luanda, the capital of Angola, where people from the inner regions of the country, with less westernization of life patterns, tend to live and where the recent economic growth is not yet felt. However, the mean BMI found is similar to the mean BMI calculated for the Africa Region in 2008 (23.9 Kg/m^2 in women and 21.8 Kg/m^2 in men),[5] and the pooled prevalence of overweight and obesity in the SSA region of 22.2% estimated in 2010,[4] being 22.7% (95% CI 21.0, 24.4) in our study.

In all reviews and WHO appraisals for African regional trends obesity is rising in the last decades according to the stages of nutrition transition.[6,8,11,13] If this tendency confirms also for the Dande-HDSS population, in the next decade the prevalence of overweight and obesity will increase, raising the concern for action related with NCD and associated risk factors.

The Dande-HDSS was developed as a district-level surveillance system in an urban and rural setting and is not representative of the demographic structure of Angola, but the findings, though not immediately generalizable, reveal the coexistence of similar levels of underweight and obesity, especially in urban areas and among females, common in the region,[13,21] as shown in studies conducted in South Africa,[22] Ghana,[23] and Nigeria.[24]

The prevalence of overweight and obesity is higher in women in all regions of the world.[2,5,10,12] In SSA countries, like Angola, an increased level of body fat is associated with prosperity and health, and the ideals of feminine beauty includes chubbiness.[25] Being slim, in contrast, is perceived to be a sign of illness or poverty and is something to be feared and avoided, particularly in recent years, when it has been associated with AIDS.[12,26] This cultural factor that enhances the probability of obesity in SSA women and other known associations of obesity with the urbanization process, socioeconomic status, and education,[5,9-14] puts the female gender more expose to this risk factor.

Education and monthly income are essential socio-demographic determinants to consider.[10,11,21-24,25] We found a higher prevalence of overweight and obesity among subjects with higher income regardless of gender but only women with a lower level of education presented a higher prevalence of overweight and obesity. Higher incomes tend to be associated with differentiated professions, more sedentary, and to allow access to a more rich diet. If you asso-

Table 2. Body Mass Index categories by sex and socio-demographic characteristics.

	Women % (95% CI)*					Men % (95% CI)*				
	Underweight	Normal	Overweight	Obese	P-Value	Underweight	Normal	Overweight	Obese	P-Value
Age										
15-24 years	18.5 (14.8-22.8)	68.8 (63.8-73.3)	9.8 (7.2-13.2)	3.0 (1.7-5.3)	<0.001	18.4 (15.2-22.0)	77.3 (73.4-80.8)	3.5 (2.2-5.5)	0.8 (0.3-2.1)	<0.001
25-34 years	5.8 (3.7-9.0)	58.8 (53.3-64.2)	24.4 (20.0-29.5)	10.9 (7.9-14.9)		5.3 (3.3-8.5)	79.7 (74.8-83.8)	12.7 (9.4-16.9)	2.3 (1.1-4.7)	
35-44 years	6.1 (3.7-10.0)	48.0 (41.6-54.5)	26.2 (20.9-32.3)	19.7 (15.0-25.3)		9.9 (6.1-15.7)	62.3 (54.3-69.6)	20.5 (14.9-27.7)	7.3 (4.1-12.6)	
45-54 years	7.4 (4.5-12.1)	56.4 (49.2-63.3)	22.3 (17.0-28.8)	13.8 (9.6-19.5)		11.0 (6.4-18.3)	64.2 (54.9-72.6)	20.2 (13.7-28.7)	4.6 (2.0-10.3)	
55-64 years	9.3 (5.4-15.6)	51.2 (42.6-59.6)	29.5 (22.3-37.8)	10.1 (6.0-16.5)		10.3 (5.5-18.5)	70.1 (59.8-78.7)	13.8 (8.1-22.6)	5.7 (2.5-12.8)	
Place of residence										
Urban	10.1 (8.3-12.1)	58.2 (55.1-61.2)	20.2 (17.9-22.9)	11.5 (9.6-13.6)	0.184	13.4 (11.4-15.8)	72.2 (69.2-75.0)	11.1 (9.2-13.3)	3.3 (2.3-4.6)	0.011
Rural	10.9 (7.5-15.6)	60.7 (54.2-66.8)	21.8 (17.0-27.6)	6.6 (4.0-10.5)		7.9 (5.0-12.2)	82.4 (76.8-86.9)	8.8 (5.7-13.3)	0.9 (0.3-3.3)	
Education										
None	8.4 (5.3-13.0)	57.6 (50.8-64.2)	22.7 (17.4-28.9)	11.3 (7.7-16.4)	<0.001	20.0 (7.0-45.2)	80.0 (54.8-93.0)	-°	-°	<0.001#
1-4 years	6.4 (4.5-9.2)	53.1 (48.3-57.8)	25.2 (21.3-29.6)	15.2 (12.1-19.0)		12.1 (7.5-19.0)	75.0 (66.7-81.8)	12.1 (7.5-19.0)	0.8 (0.1-4.4)	
5-9 years	13.6 (10.7-17.1)	61.8 (57.2-66.3)	17.0 (13.8-20.8)	7.6 (5.5-10.5)		16.3 (13.5-19.6)	71.2 (67.3-74.8)	10.0 (7.8-12.8)	2.5 (1.5-4.2)	
>10 years	13.8 (9.3-19.9)	65.0 (57.3-72.0)	15.6 (10.8-22.0)	5.6 (3.0-10.3)		7.1 (5.1-9.9)	77.5 (73.3-81.1)	11.5 (8.8-14.8)	3.9 (2.5-6.2)	
Marital Status										
Living alone	9.4 (6.0-14.3)	54.7 (47.6-61.6)	24.0 (18.5-30.5)	12.0 (8.1-17.3)	<0.001	10.3 (5.7-17.9)	76.3 (66.9-83.6)	10.3 (5.7-17.9)	3.1 (1.1-8.7)	<0.001
Living with parents	20.4 (16.2-25.3)	68.1 (62.7-73.1)	8.6 (5.9-12.2)	3.0 (1.6-5.5)		18.8 (15.5-22.6)	76.3 (72.2-79.9)	3.6 (2.3-5.7)	1.3 (0.6-2.8)	
Living with companion	6.0 (4.5-8.0)	55.7 (52.0-59.3)	25.0 (21.9-28.3)	13.3 (11.0-16.0)		7.4 (5.5-9.8)	72.4 (68.5-75.9)	16.0 (13.2-19.3)	4.3 (2.9-6.3)	
Montly Family Income										
No income	11.7 (6.3-20.7)	59.7 (48.6-70.0)	24.7 (16.4-35.4)	3.9 (1.3-10.8)	0.001	3.6 (0.6-17.7)	71.4 (52.9-84.7)	17.9 (7.9-35.6)	7.1 (2.0-22.6)	0.021
≤150 USD	7.2 (5.0-10.3)	60.3 (55.3-65.2)	23.1 (19.1-27.6)	9.4 (6.8-12.8)		10.1 (6.8-14.7)	76.3 (70.4-81.4)	11.8 (8.3-16.7)	1.8 (0.7-4.4)	
151-299 USD	3.6 (1.7-7.2)	52.3 (45.3-59.2)	27.2 (21.4-33.8)	16.9 (12.3-22.8)		4.6 (2.3-8.8)	74.9 (67.9-80.7)	16.6 (11.8-22.8)	4.0 (2.0-8.0)	
≥300 USD	2.2 (0.4-11.6)	46.7 (32.9-60.9)	26.7 (16.0-41.0)	24.4 (14.2-38.7)		5.6 (2.9-10.7)	66.9 (58.8-74.1)	19.0 (13.4-26.3)	8.5 (4.9-14.2)	

*Post-stratification weights used as described in the methods section; °No individuals in this category; #Fisher's Exact Test.

ciated the lower level of education of women (traditionally with domestic occupations) and the lack of knowledge to make the healthier choices (usually the family planner of meals), these factors can explain the results encountered. This is also compatible with other studies results, where living with a companion is associated with higher body weight.[27]

BMI is an indicator of multifactorial exposures, mainly behavioral and environmental in nature, such as caloric intake and physical activity, with individual genetic profile also having a role.[28] A closer surveillance of populations is needed, to detect changes in the so-called cause of the causes or interactions between this factors. This study provides a much-needed baseline for the evaluation of trends and interventions in Angola, even if of a more local framework. The frequency of NCD is expected to increase but data is still lacking and there must be a specific effort to accommodate a new reality to a health system mainly prepared to deal with the burden of infectious diseases, even at the level of information processes.

The training of human resources and the aim of the policies shall reflect this changes,[13] and incorporate appropriate responses to approach therapeutic and preventive health care, taking advantage of infectious diseases programs already in place,[29] and prioritizing the global obesity epidemic, one of seven risk factor targeted by the WHO "Global Action Plan for the Prevention and Control of NCDs, 2013/2020".[30]

Conclusions

Obesity and underweight have a similar impact in this population describing an early stage of nutrition transition. Prevalence of overweight and obesity was higher in urban areas, among older individuals with a larger income, in both genders, and amongst more educated males. Female lower education and income compared with male, increases the need for dedicated health promotion programs that tackle the gender issue. Together with the double burden of communicable and NCD, this fight becomes more relevant in women if we consider that in the majority of the families they are the daily diet planners.

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