Socio-demographic predictors of obesity among women in Uganda: A cross-sectional study

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Abstract

Background

Recent studies indicate an increase in the prevalence of overweight and obesity among women in Uganda; these have been associated with factors like age, marital status, income status, the number of children, and level of education, among others. However, most studies rely solely on the body mass index as the indicator of obesity. This study examined the socio demographic factors associated with obesity among women aged 18–59 years in Mukono Central Division of Central Uganda.

Methods

A cross sectional study design using quantitative methods was employed. A total of 384 women between 18 and 59 years were selected by simple random sampling. A semi structured questionnaire and anthropometric measurements were used to collect data.

Results

Age and marital status were positively associated with overweight-body mass index classification (Age–OR 1.9; CI 1.3–3.0; p = 0.003: marital status–OR 2.1; 1.1–3.8; p = 0.021), obese-body mass index classification (Age–OR 2.3; CI 1.3–3.8; p = 0.002: marital status–OR 2.8; 1.1–7.2; p = 0.029), increased risk-waist circumference classification (Age–OR 3.2; CI 2.0–5.1; p = 0.000: marital status–OR 2.4; 1.3–4.6; p = 0.005) and substantially increased risk-waist hip ratio classification (Age–OR 1.9; CI 1.2–3.0; p = 0.005: marital status–OR 2.7; 1.3–5.5; p = 0.006). Age was also positively associated with overfat-Total Body Fat percentage classification(Age–OR 2.2; CI 1.4–3.5; p = 0.001) and excessive-Abdominal Fat Level classification (Age–OR 3.2; CI 1.1–9.4; p = 0.03). Employment status was negatively associated with obese-Total Body fat Percentage classification (Employment status–OR 0.6; CI 0.4–0.9; p = 0.015).

Conclusions

Generalized and abdominal obesity in women were both predicted by age, marital status, and employment status. Identifying the changes that occur in the lives of women as they grow older, get married, and have children, and what it is about being unemployed, that predisposes women to obesity within the Ugandan context, will be instrumental in guiding interventions to curb the emerging obesity epidemic among women in Uganda.

Background

Overweight and obesity have increased globally among women exposing them to different cardiovascular diseases (WHO, 2012a) with a reported increase from 31.7% in 2000 to 39.2% in 2016

(WHO (2018a). In Africa, the increasing burden of overweight and obesity has been observed in urban areas (Shrimpton and Rokx, 2012; Ngaruiya et al., 2017). Both conditions are associated with an increased risk for non-communicable diseases (NCDs), such as Type 2 diabetes, cardiovascular disease, and respiratory problems, among others (Mendez et al., 2005; Yoon et al., 2006). NCDs are the largest contributors to the years of life lost due to illness, disability, and premature mortality (WHO, 2015b) and at least 2.8 million adults including women die each year because of complications of obesity or overweight (WHO, 2012a).

Justification

The increasing prevalence of overweight/obesity in low-income countries is attributed to the rising economic development, rapid urbanization, changes in food production, dietary patterns, and physical activity (Bygbjerg, 2012; Oyeyemi et al., 2012, Yoon et al., 2006). In addition, socio demographic factors like age, marital status, level of education and wealth index are associated with the rising prevalence of overweight, and obesity.

The rates are alarming in Sub-Saharan Africa; where as much as 20–50% of urban populations were estimated to be overweight or obese (Sodjinou et al., 2008). In Uganda, the prevalence of obesity and overweight increased from 17–24% from 2006 to 2016 (UBOS, 2016). According to the 2017 Global Health Observatory Data, 30.9% of women in urban Uganda experienced overweight or obesity. This increasing trend in overweight and obesity presents a challenge to the Uganda health care system which has been traditionally overstretched by under nutrition arising from famine, food insecurity and infectious diseases. Obesity-related NCDs are projected to account for 46% of all deaths by 2030 (World Bank, 2011). Therefore, there is an urgent need for an in-depth understanding of how different social demographic factors lead to the overlap and coexistence of these forms of malnutrition to facilitate the development of effective policies and the appropriate allocation of resources to tackle them.

Methods

A cross sectional design was used to collect data on the socio demographic characteristics, and nutritional status of women. The study was conducted in Mukono central division, adjacent to the capital city, an area determined in national surveys to have a high prevalence of overweight and obesity in women (UBOS and ICF, 2018). The study targeted women between 18–59 years, because similar surveys indicated an increase in the prevalence of obesity as women grow out of their teens into their twenties and thirties and upwards.

Participants were eligible to participate if they had been residents of the selected villages for at least 6 months and were excluded if they had given birth within 6 months of the study, pregnant or declined to consent. A Total of 384 respondents were selected using simple random sampling. Two-stage sampling in which a sample of a primary unit was selected and then another sample of secondary units also selected within each primary unit (Creswell et al., 2018).

The study villages and the study participants were selected by simple random sampling. Sample size was determined using the Araoye, 2003 formula.

$$N = \frac{Z^2 P (1-P)}{X^2}$$

Where, N = sample size; Z = confidence level (which was taken as 95% with a degree of probability of 1.96%, P = total prevalence of women overweight, obesity and underweight of women taken as 50.4% (UBOS, 2016); (1 – P) = prevalence of women not malnourished; and X^2 = level of precision, taken to be 5%.

$$N = \frac{(1.96)^2 \times 0.504 \times (1-0.504)}{0.05^2} = 384 \text{ respondents.}$$

Informed consent

was sought and if willing to participate, the woman was interviewed. Data on socio-demographic characteristics were collected using interviewer administered questionnaires. BMI and other indicators including Total Body Fat percentage (TBF%), Waist Circumference (WC), Waist Hip Ratio (WHR) and Abdominal Fat Levels (AFL) were also collected. BMI, TBF%, and AFL were determined following procedures described by TANITA. Respondent's age, sex and height were entered into TANITA BC-202-WH scale. Each participant stood (barefooted) wearing as few clothes as possible as recommended by WHO (2004), on the TANITA scale which uses bio impedance analysis. BMI, TBF%, and AFL values of the participant, displayed by the scale were then recorded. A flexible OXFORD measuring tape was used to measure waist and hip circumference of the respondents to the nearest 0.5cm. The waist hip ratio was calculated. Table 1 shows the classification of each of the indicators and the reference standards used. The data were analyzed quantitatively, (Creswell et al., 2003) using SPSS Version 20. Frequency distributions, chi square tests, and binary regression analyses were performed to identify factors associated with, and factors which predict overweight, and obesity as classified by BMI, TBF%, AFL, WC and WHR among women, respectively.

Table 1
Cut offs of body composition indicator variables according to reference standards

Indicators	Standard cut offs				
BMI (kg/m^2)[1]	< 18.50	Underweight			
	18.50–24.99	Normal			
	25.00-29.99	Overweight			
	≥30.00	Obese			
Body fat Percentage (%)[2]	Age	Body fat percentage cut off			
		Under fat	Healthy	Over fat	Obese
	18	0–16.9	17–30.9	31–35.9	> or = 36.0
	19	0–18.9	19–31.9	32–36.9	> or = 37.0
	20–39	0–20.9	21–32.9	33–38.9	> or = 39.0
	40–59	0–22.9	23–33.9	34–39.9	> or = 40.0
Abdominal fat level[2]	1–12	Healthy			
	> 12	Excessive			
Waist circumference (cm)[3]	< 80	Low risk of metabolic complications			
	80–88	Increased risk of metabolic complications			
	> 88	Substantially increased risk of metabolic complications			
Waist Hip Ratio[3]	< 0.85	Low risk of metabolic complications			
	≥ 0.85	Substantially increased risk of metabolic complications			
Adopted from: (1)WHO (2004); (2) TANITA (2018); (3) WHO (2008)					

Results

Socio-demographic characteristics of women

Table 1 shows the socio demographic characteristics of the 384 respondents. 54.4% lived in village A, closer to the capital city, while 45.6% lived in village B, located further from the Capital city. More than half of the respondents (59.1%) were aged less than 30 years while 40.9% were 30 years or older. Most of the study participants (88.8%) had secondary level education or lower, while 11.2% had tertiary training.

Table 2
Socio demographic characteristics of respondents (n = 384)

Characteristics	Categories	(n)	(%)
Village	Village A	209	54.4
	Village B	175	45.6
Age (years)	< 30 years	227	59.1
	Over 30years	157	40.9
Religion	Christian	324	84.4
	Muslim	60	15.6
Ethnicity	Muganda	211	54.9
	Not Muganda	173	45.1
Education Level	Secondary or lower	341	88.8
	Tertiary or University	43	11.2
Marital status	Single- Never married	103	26.8
	Married-ever married	281	73.2
Childbearing status	No child	73	19.0
	At least one child	311	81.0
Employment status	Not working	166	43.2
	Working	218	56.8
Income category	Below average (Ugx145,052)	101	46.3
	Above average (Ugx145,052)	117	53.7
Expenditure category	Below average (Ugx145,052)	82	21.4
	Above average (Ugx145,052)	302	78.6
Origins	Other areas (rural)	308	80.2
	Greater Kampala (urban)	76	19.8
Migration reason	Other reasons	269	70.1
	To work	115	29.9
Household size	Below average (< 4)	163	42.4
	Above average (≥ 4)	221	57.6
Source: Primary data collection			

Prevalence of malnutrition

Table 2 shows the prevalence of malnutrition based on different anthropometric and body composition parameters: BMI, TBF%, AFL, WC and WHR. Based on BMI, 50.5% were overweight and 20.8% were obese. Based on TBF%, 64.3% were overfat whereas 40.4% were obese. Based on AFL, 4.7% had an excessive level of AFL whereas 95.3% had a healthy level of AFL. Based on WC, 58.1% were classified as being at increased risk whereas 41.9% were classified as being at low risk of metabolic syndrome-related disease. Based on WHR, 37.5% were classified as being at substantially increased risk whereas 62.5% were classified as being at low risk of metabolic syndrome-related disease.

Table 3
Distribution of overweight, overfat, obesity and abdominal obesity

Variables	Categories	(n)	(%)
Body mass index	Overweight	194	50.5
	Not overweight	190	49.5
Body mass index	Obese	80	20.8
	Not obese	304	79.2
Total fat percentage	Over fat	247	64.3
	Not over fat	137	35.7
Total fat percentage	Obese	155	40.4
	Not obese	229	59.6
Abdominal fat	Excessive	18	4.70
	Healthy	366	95.3
Waist circumference	Low risk	161	41.9
	Increased risk	112	29.2
Waist-hip ratio	Normal	240	62.5
	Substantially increased risk	144	37.5

Source: Primary data collection

Table 3 shows the distribution of overweight, overfat, obesity and abdominal obesity. Findings revealed that about half (50.5%) of the respondents were overweight using BMI, using the same index, 20.8% were obese and 79.2% not obese. Obesity was more prevalent (40.4%) using total fat percentage as compared to other indices. Furthermore, Table 3 indicates that 95.3% of the respondents had a healthy abdominal fat and only 4.7% had excessive; with waist circumference, 41.9% had low risk whereas 29.2% had increased risk and with waist-hip ratio, 62.5% were normal while 37.5% had substantially increased risk.

Factors associated with obesity

Chi square test analysis in Table 4 indicates that BMI defined as overweight was significantly associated with age, X^2 (1, N = 384) = 15.044, p = .000, marital status, X^2 (1, N = 384) = 15.405, p = .000, and child-bearing status, X^2 (1, N = 384) = 9.550, p = .002. 98 (62.4%) of the women over 30 years old were overweight compared to 42.3% of those who were younger than 30 years of age. More than half (56.6%) of those who were married or ever married were overweight compared to 34.0% of those who were single or never married. About Fifty four percent of those who had at least one child were overweight compared to 34.2% of those that had no child-bearing experience.

Chi square test analysis also showed that, a

BMI classified as obesity was significantly associated with age, X^2 (1, N = 384) = 17.339, *P = .000*, marital status, X^2 (1, N = 384) = 16.816, *P = .000* and child-bearing status, X^2 (1, N = 384) = 12.883, p = .000. Thirty-one-point two percent of the women over 30 years were obese compared to 13.7% of those who were younger than 30 years of age.

Further, Chi square results indicated that TBF%-defined as overfat was significantly associated with marital status, X^2 (1, N = 384) = 16.973, p = .000, marital status, X^2 (1, N = 384) = 11.744, p = .001, and child-bearing status, X^2 (1, N = 384) = 10.535, p = .001. More than half (76.4%) of the respondents over 30 years were overfat compared to 55.9% of those who were younger than 30 years of age. In addition, 69.4% of those who were married or ever married were overfat compared to 50.4% of those who were single or never married.

TBF% classified as obesity was significantly associated with marital status, X^2 (1, N = 384) = 10.158, *P = .001*, child-bearing status, X^2 (1, N = 384) = 6.296, *P = .012* and employment status, X^2 (1, N = 384) = 7.444, p = .006. Forty-five-point two percent of those who were married or ever married were obese compared to 27.2% of those who were single or never married.

Table 4
Factors associated with the body composition of women

Characteristic	Category	Not overweight	Overweight	Total
Age (X^2 = 15.044; p = 0.000)	< 30 years old	131 (57.7%)	96 (42.3%)	227 (59.1%)
	≥ 30 years old	59 (97.65)	98 (62.4%)	157 (49%)
Marital status (X^2 = 15.405; p = 0.000)	Single-never married	68 (66.0%)	35 (34.0%)	103 (26.8%)
	Married-ever married	122 (43.4%)	159 (56.6%)	281 (73.2%)
Child-bearing status (X^2 = 9.550; p = 0.002)	No child	48 (65.8%)	25 (34.2%)	73 (19.0%)
	At least one child	142 (45.7%)	169 (54.3%)	311 (81.0%)
Characteristic	**Category**	**Not obese**	**Obese**	**Total**
Age (X^2 = 17.339; p = 0.000)	< 30 years old	196 (86.3%)	31 (13.7%)	227 (59.1%)
	≥ 30 years old	108 (68.8%)	49 (31.2%)	157 (40.9%)
Marital status (X^2 = 16.816; p = 0.000)	Single-never married	96 (93.2%)	7 (6.8%)	103 (26.8%)
	Married-ever married	208 (74.0%)	73 (26.0%)	281 (73.2%)
Child-bearing status (X^2 = 12.883; p = 0.000)	No child	69 (94.5%)	4 (5.5%)	73 (19.0%)
	At least one child	235 (75.6%)	76 (24.4%)	311 (81.0%)
Characteristic	**Category**	**Not overfat**	**Overfat**	**Total**
Age (X^2 = 16.973; p = 0.000)	< 30 years old	100 (44.1%)	127 (55.9%)	227 (59.1%)
	≥ 30 years old	37 (23.6%)	120 (76.4%)	157 (40.9%)
Marital status (X^2 = 11.744; p = 0.001)	Single-never married	51 (49.5%)	52 (50.4%)	103 (26.8%)
	Married-ever married	86 (30.6%)	195 (69.4%)	281 (73.2%)

Characteristic	Category	Not overweight	Overweight	Total
Child-bearing status (X^2 = 10.535; p = 0.001)	No child	38 (52.1%)	35 (47.9%)	73 (19.0%)
	At least one child	99 (31.8%)	212 (68.2%)	311 (81.0%)
Characteristic	**Category**	**Not obese**	**Obese**	**Total**
Marital status (X^2 = 10.158; p = 0.001)	Single-never married	75 (72.8%)	28 (27.2%)	103 (26.8%)
	Married-ever married	154 (54.8%)	127 (45.2%)	281 (73.2%)
Child-bearing status (X^2 = 6.296; p = 0.012)	No child	53 (72.6%)	20 (27.4%)	73 (19.0%)
	At least one child	176 (56.6%)	135 (43.45)	311 (81.0%)
Employment status (X^2 = 7.444; p = 0.006)	Not working	86 (51.8%)	80 (48.2%)	166 (43.2%)
	Working	143 (65.6%)	75 (34.4%)	218 (56.8%)

Table 5 shows that Chi square test for AFL defined as excessive indicated that it was significantly associated with age, X^2 (1, N = 384) = 7.673, p = .006, and marital status, X^2 (1, N = 384) = 4.352, p = .037. Only a few (8.3%) of the respondents over 30 years had AFL defined as excessive compared to 2.2% of those who were younger than 30 years of age.

Regarding waist circumference, Chi square results indicated that WC was significantly associated with age, X^2 (1, N = 384) = 36.770, p = .000, marital status, X^2 (1, N = 384) = 28.364, p = .000, and child-bearing status, X^2 (1, N = 384) = 21.016, p = .000. Most (76.4%) of the respondents over 30 years were at increased risk compared to 45.4% of those who were younger than 30 years of age. In addition, 66.2% of those who were married or ever married were at increased risk compared to 35.9% of those who were single or never married.

Chi square test indicates that WHR was significantly associated with age, X^2 (1, N = 384) = 16.815, p = .000, marital status, X^2 (1, N = 384) = 28.977, p = .000, and child-bearing status, X^2 (1, N = 384) = 21.786, p = .000. Forty-nine-point seven percent of the respondents over 30 years were at substantially increased risk compared to 29.1% of those who were younger than 30 years of age.

Table 5
Factors associated with the body composition of women

Characteristic	Category	Healthy	Excessive	Total
Age (X^2 = 7.673; p = 0.006)	< 30 years old	222 (97.8%)	5 (2.2%)	227 (59.1%)
	≥ 30 years old	144 (91.7%)	13 (8.3%)	157 (40.9%)
Marital status (X^2 = 4.352; p = 0.037)	Single-never married	102 (99.0%)	1 (1.0%)	103 (26.8%)
	Married-ever married	264 (94.0%)	17 (6.0%)	281 (73.2%)
Characteristic	**Category**	**Low risk**	**Increased risk**	**Total**
Age (X^2 = 36.770; p = 0.000)	< 30 years old	124 (54.6%)	103 (45.4%)	227 (59.1%)
	≥ 30 years old	37 (23.6%)	120 (76.4%)	157 (40.9%)
Marital status (X^2 = 28.364; p = 0.000)	Single-never married	66 (64.1%)	37 (35.9%)	103 (26.8%)
	Married-ever married	95 (33.8%)	186 (66.2%)	281 (73.2%)
Child-bearing status (X^2 = 21.016; p = 0.000)	No child	48 (65.8%)	25 (34.2%)	73 (19.0%)
	At least one child	113 (36.3%)	198 (63.7%)	311 (81.0%)
Characteristic	**Category**	**Low risk**	**Substantially increased risk**	**Total**
Age (X^2 = 16.815; p = 0.000)	< 30 years old	161 (70.9%)	66 (29.1%)	227 (59.1%)
	≥ 30 years old	79 (50.3%)	78 (49.7%)	157 (40.9%)

Characteristic	Category	Healthy	Excessive	Total
Marital status (X^2 = 28.977; p = 0.000)	Single-never married	87 (84.5%)	16 (15.5%)	103 (26.8%)
	Married-ever married	153 (54.4%)	128 (45.6%)	281 (73.2%)
Child-bearing status (X^2 = 21.786; p = 0.000)	No child	63 (86.3%)	10 (13.7%)	73 (19.0%)
	At least one child	177 (56.9%)	134 (43.1%)	311 (81.0%)

Predictors of obesity

Results for the predictors of obesity based on a binary regression analysis are shown in Table 6. As shown, women over 30 years old were 1.939 times more likely to have BMI classified as overweight than those less than 30 years old (OR 1.939; CI: 1.254–2.998; P = 0.003) and those who were married or had ever been married were 2.065 times more likely to have BMI classified as overweight than those who were single-never married (OR 2.065; CI: 1.114–3.825; P = 0.021).

Results also indicated that women over 30 years old were 2.255 times more likely to have BMI classified as obese than those less than 30 years old (OR 2.255; CI: 1.338–3.801; *P = 0.002)* and those who were married or had ever been married were 2.837 times more likely to have BMI classified as obese than those who were single-never married (OR 2.837; CI: 1.112–7.238; *P = 0.029).*

Further, the same analysis indicated that women over 30 years old were 2.191 times more likely to have TBF% classified as overfat than those less than 30 years old (OR 2.191; CI: 1.368–3.510; *P = 0.002)*

Table 6
Predictors of body composition of women

Body composition	Age	Marital status	Employment status
Overweight-BMI	1.939 (1.254–2.998)**	2.065 (1.114–3.825)*	–
Obesity-BMI	2.255 (1.335–3.801)**	2.837 (1.112–7.238)*	–
Overfat-TBF%	2.191 (1.368–3.510)**	–	–
Obesity-TBF%	–	–	0.593 (0.390–0.903)*
Excessive-AFL	3.245 (1.117–9.423)*	–	–
Increased risk-WC	3.198 (1.996–5.124)**	2.440 (1.303–4.540)**	–
Substantially increased risk-WHR	1.887 (1.207–2.949)**	2.726 (1.341–5.540)**	–
*P < 0.05, **P < 0.01, OR = Odds ratio at 95% CI OR > 1 = High likely, = 1 = Equal, < 1 = Less likely			

Discussion

Age, marital status, and employment status were shown to predict obesity in this study. Villareal et al. (2005); Jafar et al. (2006); Pasquest et al. (2003); Hajian et al. (2006) & Dessalu et al. (2008) reported that BMI and mean body weight tended to increase with age. Many other authors (Muhihi et al., 2012; Atek et al., 2013; Pereko et al., 2013 & UBOS, 2017), have observed a positive association between age and obesity among women. This may be attributed to natural changes in body composition and the decreasing rate of metabolism associated with aging (Villareal et al., 2005; Tania et al., 2016). Studies have also shown that there is an increase in adiposity and progressive loss of muscle mass from the age ≥ 30 years in both women and men (Keller & Engelhardt, 2013). Other existing evidence also attribute brown adipose tissue that regulates fat mass and energy homeostasis in mammals to obesity; brown adipose tissue mass tends to decline slowly with age in women than in men (Pfannenberg, et al., 2010). This result implies that as women grow up into their 30s, it may be beneficial to adopt practices such as increased physical activity that increase metabolism and contribute to accumulation of muscle mass.

Marital status is an important determinant of nutritional status of women in the current study. This also concurs with findings from by Agyemang et al (2015) which indicated that marriage increases the likelihood of overweight or obesity. Similarly, results from a study in Kenya indicated that married and cohabiting respondents showed significant increased risk for obesity compared to unmarried respondents (Masibo et al., 2013). In addition to married women being typically older, this may be explained by the fact that many married women have the financial support of their partners while single

women need to make all ends meet on their own, and therefore less likely to achieve sufficient food security to trigger obesity (Mtumwa et al., 2015).

The study also revealed that employed women were less likely to be obese than those who were unemployed. This contradicts most studies (Ball et al., 2012, Bagum et al., 2020) which indicated that employed women were most likely to be overweight/obese due to more income and sedentary lifestyle. The possible reason for this contradiction is that, whereas 56.8% were employed, most of them were involved in work such as tailoring that involves physical activity leading to more energy expenditure as also noted by Saikia & Hazarika (2012) and UBOS (2016). In contrast, those who stay at home have more opportunities for being sedentary.

Conclusion

In conclusion, the study showed that generalized and abdominal obesity in women were both predicted by age, marital status, and employment status. As such, identifying the changes that occur in the lifecycle of women as they grow older, get married, and have children, and what it is about being unemployed, that predisposes women to obesity within the Ugandan context, will be instrumental in guiding interventions to curb the emerging obesity epidemic among women in Uganda.

Declarations

Ethics and approval

The study protocol was approved by Mbale Regional Referral Hospital Research Ethics committee (**No. MRRH-REC OUT01042018)**. Registered by Uganda National Council for Science and Technology **(No. SS4961).** Informed written consent was obtained from participants after explaining the study objectives. Participation was voluntary and participants were free to withdraw from the study at any time. All data collection methods and process were performed according to the relevant guidelines and regulations. The study didn't involve the use of human tissue samples.

Consent for publication

Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interest

The authors declare that they have no competing interests.

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Author's contributions

JA, GS, FM and JN participated in planning the study design. JA and GS collected, analyzed, and interpreted the data. JA, GS, FM and JN drafted the original manuscript. All authors were involved in the statistical analyses. They reviewed and approved the final manuscript.

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Author's information

Not applicable

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