International Journal of Clinical Nutrition, 2014, Vol. 2, No. 3, 60-68
Available online at http://pubs.sciepub.com/ijcn/2/3/3

DOI:10.12691/ijcn-2-3-3

Predictors of Overweight/Obesity in Urban Ghanaian Women

Collins A. Appiah[1,*], Matilda Steiner-Asiedu[2], Gloria E. Otoo[2]

[1]Department of Dietetics, School of Allied Health Sciences, University of Ghana, Accra, Ghana
[2]Department of Nutrition and Food Science, University of Ghana, Accra, Ghana
*Corresponding author: coliafriyie@yahoo.com

Received August 28, 2014; Revised September 09, 2014; Accepted September 21, 2014

Abstract Body size preference as well as diet, and physical activity could be important determinants of overweight/obesity among urban Ghanaian women. The study was designed to determine the relationship between dietary intake, physical activity level, body size preference and body mass index (BMI) in women in Kumasi metropolis, Ghana. A cross-sectional study was conducted among 394 women, aged 20 years and above, in 6 randomly selected churches in the Kumasi metropolis. Subjects were assessed through 24-hr dietary intake, physical activity levels using the WHO global physical activity questionnaire and anthropometry. Participants were asked to select their preferred body size from photographic silhouettes consisting of six images of women of known BMI (20, 24, 28, 30, 33 and 38kg/m^2) arranged in random order. The silhouettes were transformed on a scale of 1 to 6, in ascending BMI, as continuous variables for analysis. Binary logistic regression analysis was used to assess the predictors of overweight/obesity among the women. Based on BMI, 31.3% of the women were overweight and 37.1% obese. The significant predictors of overweight/obesity among the women were total dietary energy intake (OR=1.001, p=0.012), low physical activity (OR=3.136, p=0.011), preference for large body size (OR=5.197, p=0.032), being of age 40 years and above (OR=2.558, p=0.017) and having at least one child (OR=3.878, p=0.002). Diet high in calories, low physical activity levels coupled with preference for large body size could contribute to the high prevalence of overweight/obesity among the women. Clinical and public health intervention strategies should be culturally-tailored in mitigating the emerging overweight/obesity problem.

Keywords: *body size preference, dietary intake, physical activity, overweight/obesity, women*

Cite This Article: Collins A. Appiah, Matilda Steiner-Asiedu, and Gloria E. Otoo, "Predictors of Overweight/Obesity in Urban Ghanaian Women." *International Journal of Clinical Nutrition*, vol. 2, no. 3 (2014): 60-68. doi: 10.12691/ijcn-2-3-3.

1. Introduction

Obesity is a major global public health problem. Previously, the obesity epidemic was only associated with industrialised countries. Although the prevalence of obesity in developing countries has not reached epidemic proportions as in developed countries, there is evidence of an alarming upward trend in obesity rates in many developing countries [1,2]. In 2003, the WHO estimated that about 115 million of the 300 million obese people live in low-income countries [3]. The prevalence of overweight and obesity in urban sub-Saharan Africa was found to range between 23% in Malawi to 35% in Niger and Ghana, and 38% in Kenya [4]. It was estimated that overweight/obesity rates would increase by about 35% within a 10-year period, with about 5% increase in the annual rate [4].

The mechanisms of the increasing trend in overweight and obesity rates in developing countries have been largely linked to the nutrition transition accompanying westernisation, urbanisation, technological development, food processing, food market globalisation, and rising disposable income [2,3,5,6]. There is the rapid exchange of traditional lifestyles (energy-intensive occupations, consumption of unrefined and low fat diets etc.) with highly obesogenic alternatives (more sedentary occupations, reduced physical activity, accessibility, affordability and consumption of foods high in total calories, fats, sugar, and low in fibre) [5].

Apart from changes in dietary and physical activity patterns, it has been suggested that the high social and cultural valuation of large body size/fatness in some developing societies could be significant in promoting obesity [2,7,8,9,10,11]. Studies in African populations have reported association of a large body size with positive attributes. These include reports from Senegal [9], South Africa [10] and Morocco [11]. The sociocultural environment could have important implications on the prevalence of overweight and obesity, and intervention strategies among African populations.

In Ghana, the prevalence of overweight and obesity among urban women is on the increase. In the 1987-89 National Health Survey the overall prevalence rate of overweight and obesity (body mass index (BMI) >25kg/m^2) among Ghanaian women between 20-65 years was found to be 18% [12]. The 2003 Ghana Demographic and Health

Survey showed the prevalence of overweight and obesity (BMI ≥ 25kg/m^2) among Ghanaian women in urban areas as 35.1% [13]. Similar to other developing countries undergoing nutrition transition, increasing overweight and obesity rates in Ghana is linked to urbanisation, westernisation, rising income and changing diet and physical activity patterns [2,5,14].

Culturally, a large body size is seen in a positive light among Ghanaians. Particularly, in women increasing body size/weight is usually perceived as a sign of beauty, good health and happiness in marriage. As reported in Moroccan women [11], this attitude could pose a psychological barrier that limits awareness of overweight/obesity as well as motivation for weight control.This study was undertaken in Kumasi, the second largest city in Ghana. The rate of overweight and obesity was reported to be about three times more among women than in men in the metropolis (26% versus 8%, respectively) [15]. Kumasi is the capital of the Ashanti region. The Ashantis are matrilineal which places women in a key position in the family. As such, women's health behaviours especially dietary and physical activity habits as well as attitudes and perceptions related to body size/weight could be expected to impact on other members of the family, especially children. This could present the women sub-group as potential intervention target against the emerging overweight/obesity problem in the population. Currently, there is a paucity of research data examining the combined effects of diet, physical activity, body size preferences, attitudes and beliefs related to body size on the body weight of Ghanaian women, and women from other African countries. This study sought to examine the relationship between diet, physical activity, body size preference and body mass index (BMI) in women in Kumasi Metropolis, Ghana.

Data from this research could provide a firm basis for nutrition experts, public health advocates and other front-line health professionals to develop culturally competent programmes and interventions against overweight/obesity among the women, and the general populace at large. This will help mitigate the obesity burden as well as the associated health and economic costs.

2. Materials and Methods

2.1. Subjects

The study was a cross-sectional survey. A total of 394 women, aged 20 years and above, were recruited from 6 randomly selected churches in the Kumasi metropolis. All consenting non-pregnant women within the age bracket in women and youth fellowship wings of the selected churches who have no audio-visual disabilities and were able to stand erect for anthropometric measurements were included in the study.

2.2. Ethical Approval

The study was undertaken after the Research and Ethical Review Committee of the School of Allied Health Sciences, College of Health Sciences, University of Ghana, has granted approval (Ethical Identification Number: SAHS-Et/10289558/AA/26A/2010-2011). Voluntary written informed consent was also sought from the participants before recruiting them into the study.

2.3. Sampling Technique

All women in women and youth fellowship wings of churches located in each sub-metropolis were given equal chance to participate in the study. A stratified two-stage cluster sampling technique was employed. First, the Kumasi Metropolis was classified into the 10 sub-metropolitan areas based on Kumasi Metropolitan Assembly classifications [16]. Six (6) sub-metropolitan areas were randomly selected to serve as study areas. Second, list of member churches from the Christian Council of Ghana, Catholic Church, and the Association of Ghana Pentecostal and Charismatic Churches, in each of the 6 selected sub-metropolitan areas, were obtained. Codes were assigned to the churches in each sub-metropolis. The codes were written on sheets of paper which were folded and placed in a basket. One folded sheet was then picked at random from the basket without replacement to serve as study site. This was repeated for each of the 6 sub-metropolis. In all, a total of 6 churches were used as study sites.

Figure 1.

2.4. Body Size Silhouettes

Body size silhouettes (Figure 1) consisting of six figural images, coded alphabetically, of known body mass indices (20, 24, 28, 30, 33 and 38kg/m^2) and waist-to-hip ratios (WHR, 0.71-0.93) were shown to respondents to select one in response to a list of questions. The silhouettes (female only) had been developed elsewhere [17] and were also used in a similar study in Senegal [9]. The silhouettes have a unique advantage of being based on photographic images of individuals of known BMI (20, 24, 28, 30, 33 and 38kg/m^2) and WHR (0.71-0.93). They also confer a neutral appearance in terms of ethnicity as they do not show facial features and are shaded in so that they appear neutral in terms of skin colour. They were coded alphabetically to avoid the suggestion of merit which ordinal labelling might convey [17]. The six images or

silhouettes were presented on each of three A3 cards, A (Figure 2), B (Figure 3) and C (Figure 4) (BMI and WHR values were not shown). The individuals appear in random order to avoid respondents becoming too accustomed to them and opting for a shape they recognize [9]. The cards were also shown to the respondents at random to prevent familiarity with a particular image.

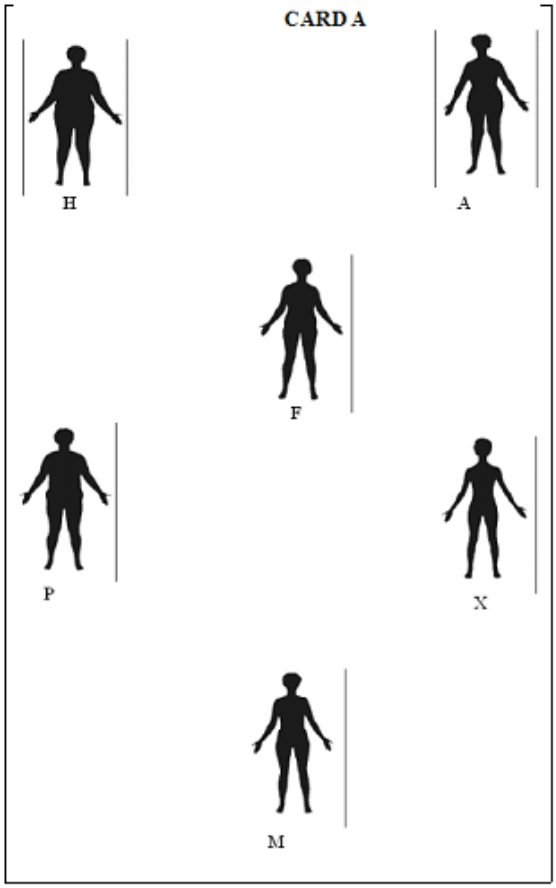

Figure 2.

2.5. Data Collection

2.5.1. Socio-demographic Data

Data on ethnicity, age, marital status, parity, educational status, occupation were collected with an interviewer-administered structured questionnaire.

2.5.2. Data on Body Size Preference and Attributes Associated with Body Size

Data on body size preference and attributes associated with body size/weight were collected with the aid of the body size silhouettes. Some of the items in this section include questions such as *"Which figure on Card A depicts your current body size? Which figure on Card C depicts your preferred body size? Which figure on Card B depicts an obese individual? Which figure on card A depicts a healthy individual?"*

2.5.3. Food Intake Data

Food intake was assessed through diet history interview. This was done using a three-day (two week days and one weekend day) 24 hour recall of usual dietary intake of all meals and snacks. Graduated food models and handy measures were used to aid in portion size delineation and assist respondent in estimating quantities. Only 330 respondents completed the diet history assessment.

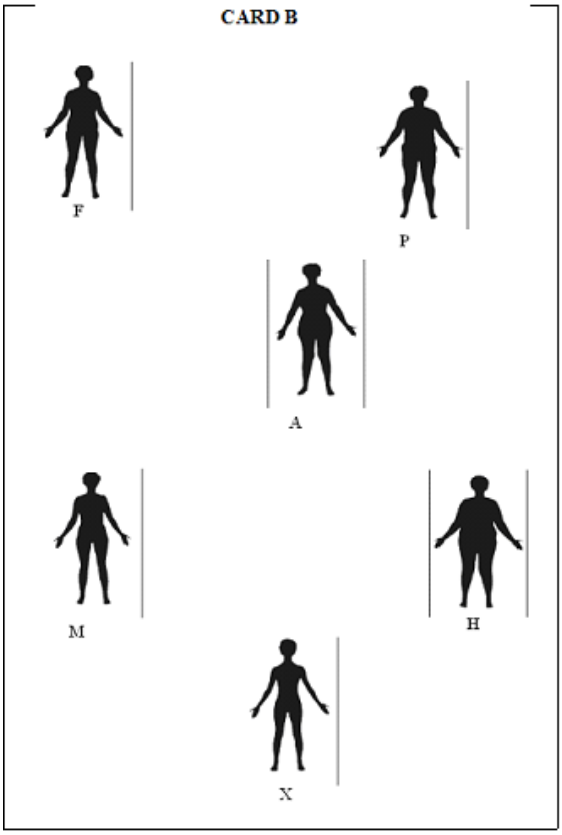

Figure 3.

2.5.4. Physical Activity Data

Physical activity level was evaluated using the WHO Global Physical Activity Questionnaire (GPAQ) version 2. The GPAQ was used to collect information on physical activity participation in three settings and sedentary behaviour. The three settings were activity at work; travel to and from places, and recreational activities. The physical activity data included a 7-day recall of all moderate to vigorous intensity activities lasting for at least 10 minutes. Memory-enhancing questions and lists of usual activities were used to help with recall. The amount of time in hours each respondent spent in moderate and vigorous intensity activities was determined. The activities were given intensity values based on metabolic equivalents (METS). One MET requires 3.5 ml of oxygen per kilogram (kg) of body weight per minute. This equals approximately 1kcal/kg/h. To make the energy cost calculations, moderate intensity activities such as brisk walking, sweeping, mopping etc., were assigned 4 METS; and vigorous intensity activities such as carrying heavy load, running, skipping etc., were assigned 8 METS. To calculate the activity score (METSminutes/week), the minutes spent in each activity category was multiplied by the number of days the activity was performed and the MET value for the category. The activity score was summed over all categories of activity. The respondents were categorised as highly active when they earned 1500METSminutes/week or more; moderately active when they earned between 600METSminutes/week to 1499METSminutes/week; and less active when they earned less than 600METSminutes/week. This classification was based on the criteria provided in the WHO GPAQ version 2.

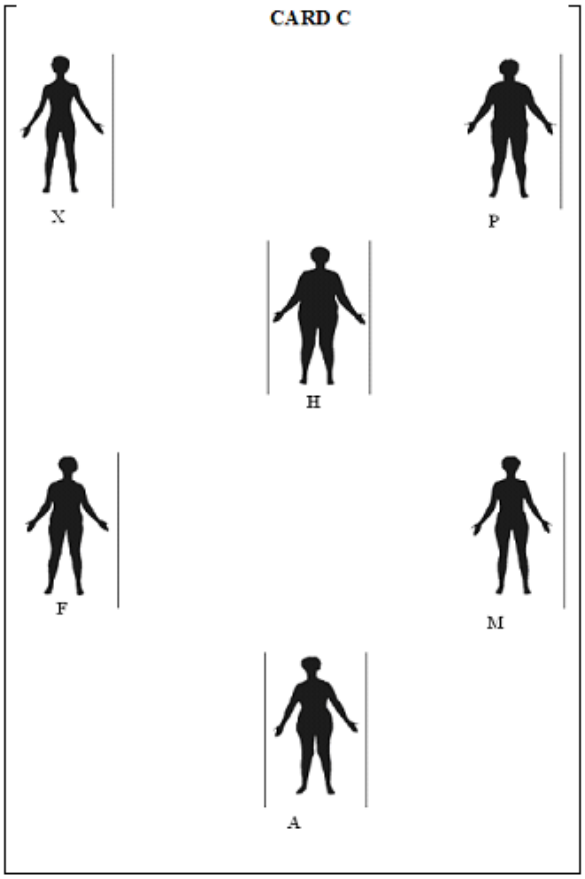

Figure 4.

2.5.5. Anthropometry Data

Respondents' weights were measured in light clothes to the nearest 0.1 kg using a portable Salter floor scale (Salter 200, UK).Height was measured correct to the nearest 0.1 cm using a seca stadiometer (seca 217, UK). BMI categories were computed using the WHO standards (WHO, 2000). Respondents were classified as low/normal weight (BMI < 25 kg/m^2) and overweight/obese (BMI ≥ 25 kg/m^2).

2.6. Quality Control

Five field assistants were recruited to assist in the data collection exercises. The field assistants were given orientation and training before data collection exercises. Data collected by field assistants were cross-checked to minimise random errors. The weighing scale was periodically calibrated with known weight to reduce systematic errors.

2.7. Statistical Analysis

The total dietary energy and macronutrient intake were analysed using the Esha F Pro Software. To evaluate attitudes to body size, the silhouettes were transformed on a scale of 1 to 6, in ascending BMI, as continuous variables for analysis. Independent samples t-test was used to test differences between two means. Analysis of variance (ANOVA) was used to test differences where mean values were more than two. Binary logistic regression analysis was used to determine the predictors of overweight/obesity among the respondents. Statistical significance was set at $p < 0.05$.

3. Results

Table 1 shows that the average age of the respondents was 43.8±14.0 years. The average number of children of the respondents was 3.0±2.0.Akans represented 96.2% of the respondents, 68.3% had low level of education, 51.8% were single and 72.6% worked in the informal sector. Respondents who reported to have never attended school or had primary, middle or junior high school education were described as low educational level. Respondents with tertiary education were described as high educational level (14%).

Table 1. Socio-demographic characteristics of respondents

Characteristic	Mean± SD
Age(years)	43.8 ±14.0
Parity	3.0±2.0
Household Size	5.0±3.0
	%
Ethnicity	
Akan	96.2
Ewe	2.0
Ga	0.8
Others	1.0
Total	100
Marital Status	
Married	48.2
Single	51.8
Total	100
Education	
Low	68.3
Middle	17.8
High	14.0
Total	100
Work Sector	
Formal	9.6
Informal	72.6
Unemployed	17.8
Total	100

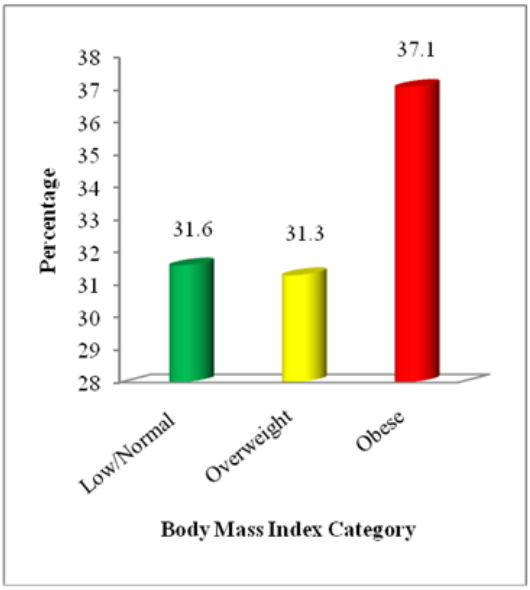

Figure 5. Prevalence of BMI defined overweight and obesity

Low/Normal was defined as BMI < 25kg/m^2. **Overweight** was defined as BMI 25-29.9kg/m^2. **Obese** was defined as BMI ≥ 30kg/m^2. N = 394.

Based on body mass index (BMI), 31.6% of the respondents were low/normal weight, 68.4% were either overweight or obese with 31.3% being overweight and 37.1% being obese (Figure 5).

The mean total energy intake of women with high educational level (2626±667kcal) was significantly higher (p= 0.030) than those with low educational level (2315±601kcal) (Table 2). There was no significant difference in mean total energy intake across BMI categories (p = 0.063), age groups (p = 0.398), marital status (p = 0.496) and parity categories (p = 0.288).

There was no significant difference in mean % protein intake across BMI categories (p = 0.476), age groups (p = 0.166), levels of education (p = 0.346), marital status (p = 0.668) and parity categories (p = 0.162) (Table 2).

Table 2 shows that the overweight/obese women had significantly higher (p = 0.024) mean % carbohydrate intake (60.5±10.0%) than low/normal weight women (57.6±11.1%). The average % carbohydrate intake was significantly higher (p = 0.001) in women who were 40 years and above (61.8±9.6%) than those who were less than 40 years (56.3±10.8%). The women with low educational level had significantly higher (p = 0.001) mean % carbohydrate intake (60.8±10.3%) than those with high educational level (54.3±10.0%). The average carbohydrate intake was significantly higher (p = 0.001) in women who had at least a child (60.7 ±10.0%) than those who had no child (56.7±10.8%). There was no significant difference in mean % carbohydrate intake across marital status (p = 0.370).

Average % fat intake was significantly higher (p = 0.001) in women who were less than 40 years (30.5±11.6%) than those who were 40 years and above (24.4±8.6%) (Table 2). The mean % fat intake was significantly higher (p = 0.006) among women with high educational level (31.3±9.8%) than those with low (26.2±10.6%) and middle (25.8±9.2%) educational levels. Average % fat intake was also significantly higher (p = 0.004) in women who had no child (29.4±9.3%) than in those who had at least a child (25.8±10.4%). There was no significant difference in mean % fat intake across BMI categories (p = 0.085) and marital status (p = 0.413).

Table 2. Macronutrient intake by demographic characteristics

	Mean Macronutrient Intake† ±SD							
Characteristic	**Energy Intake (kcal)**	**P-value**	**% Protein**	**P-value**	**% Carbohydrate**	**P-value**	**% Fat**	**P-value**
BMI Category		0.063		0.476		0.024		0.085
Low/Normal	2265±601[a]		15.1±6.2[a]		57.6±11.1[a]		28.4±8.6[a]	
Overweight/Obese	2404±660[a]		14.6±4.8[a]		60.5±10.0[b]		26.2±11.0[a]	
Age group		0.398		0.166		0.001		0.001
< 40	2404±704[a]		14.3±3.4[a]		56.3±10.8[a]		30.5±11.6[a]	
≥ 40	2334±606[a]		15.1±6.2[a]		61.8±9.6[b]		24.4±8.6[b]	
Education		0.030		0.346		0.001		0.006
Low	2315±600[a]		14.5±4.8[a]		60.8±10[a]		26.2±10.6[bc]	
Middle	2333±744[a b]		15.5±7.5[a]		59.4±10[a b]		25.8±9.2[bc]	
High	2626±666[b]		14.9±3.0[a]		54.3±10[b]		31.3±9.8[a]	
Marital Status		0.496		0.668		0.370		0.0413
Married	2342±618[a]		14.9±5.1[a]		60.1±10[a]		26.4±10.7[a]	
Single	2390±664[a]		14.7±5.3[a]		59.1±10.7[a]		27.3±9.7[a]	
Parity		0.288		0.162		0.001		0.004
No Child	2426±668[a]		14.2±3.6[a]		56.7±10.8[a]		29.4±9.3[a]	0.004
≥ One Child	2343±630[a]		15.1±5.7[a]		60.7±10.0[b]		25.8±10.4[b]	

†Mean values with different superscripts are significantly different at p < 0.05 level

Table 3 shows that the mean BMI (30.0±5.5kg/m^2) of the respondents who reported low physical activity levels was significantly higher (p = 0.011) than those who reported high physical activity levels (27.5±5.9 kg/m^2).

Table 3. Physical activity levels by BMI

Physical Activity Level	n	Mean BMI* ±SD (kg/m^2)
Low	100	30.0±5.5[a]
Moderate	174	28.3±5.4[ab]
High	73	27.5±5.9[b]
Total	347	28.6±5.6

*Mean values with different superscripts are significantly different (p= 0.011) at p < 0.05 level

Shown in Table 4 are silhouettes (body images) of individuals with a range of body sizes and BMI between 20kg/m^2 to 38kg/m^2. The body size silhouettes were transformed on a scale of 1 to 6 so that they can be analysed as continuous variables. On the left side of the table are the attributes. The triangular pointers in the middle of the table represent the mean selected body size which respondents associated with the attributes on the left side of the table. The normal size silhouette was perceived as healthy by the women (2.2±1.4) (Table 4).On average, the women identified the normal size silhouette (2.3±1.3) when describing normal body weight. The women understood obesity as they correctly chose, on average, an 'obese' silhouette (5.9±0.5) when describing obesity. However, the women equated 'overweight' with obesity as they selected an 'obese' silhouette (5.2±1.2) when describing overweight. The women chose an 'overweight' silhouette (3.2±1.6) as depicting their current body size which was similar to their actual body weight (28.3±5.6kg/m^2 i.e. 3.3 ±5.6) measured in the survey. The women selected on average about a large (overweight) body size (2.9±1.3) as their preferred body size.

Table 4. Body size and associated attributes among the women

BMI (kg/m^2)	20	24	28	30	34	38		
†Silhouette	1	2	3	4	5	6	n	Mean ±SD
Attributes								
Healthy Individual:		▲					331	2.2±1.4
Normal Weight:		▲					384	2.3±1.3
Overweight:					▲		389	5.2±1.2
Obese:						▲	389	5.9±0.5
Body Size Preference								
Actual Body Weight:			▲				394	3.2(28.3) ±5.6
Perceived Current Body Size:			▲				391	3.2±1.6
Preferred Body Size:			▲				378	2.9±1.3

†Silhouettes 1 and 2 were defined as normal body size/weight.
Silhouettes 3 and 4 were defined as large/overweight body size.
Silhouettes 5 and 6 were defined as very large/obese body size.
*Actual body weight ─ measured body mass index of women in the survey.
Conversion to the 1-6 scale was based on proportion.
** Perceived current body size─ silhouette which women associate with their current body size.

Table 5. Predictors of Overweight/Obesity among the women

Variable	Odds Ratio	95% †CI	P-value
Total Energy Intake (kcal)	1.001	1.000-1.001	0.012
% Carbohydrate	1.020	0.974-1.068	0.402
% Fat	1.022	0.971-1.077	0.407
Physical Activity Level			
Low	3.136	1.300-7.565	0.011
Moderate	1.776	0.850-3.712	0.127
High	1.000	Reference	
Preferred Body Size	5.197	1.153-23.430	0.032
Age(years)			
40+	2.558	1.185-5.519	0.017
< 40	1.000	Reference	
Parity			
Has at least a Child	3.878	1.676-8.973	0.002
Has no Child	1.000	Reference	
Marital Status			
Married	1.629	0.797-3.327	0.181
Single	1.000	Reference	
Educational Level			
Low	1.892	0.692-5.172	0.214
Middle	2.600	0.899-7.526	0.078
High	1.000	Reference	
Work Sector			
Formal	0.882	0.242-3.207	0.848
Informal	0.896	0.370-2.167	0.807
Unemployed	1.000	Reference	

†**CI**: Confidence Interval. P-values are significant at $p < 0.05$ level.

Binary logistic regression analysis showed that total energy intake, low physical activity, preferred body size, being 40 years and above, and having at least a child were significant predictors of being overweight or obese (Table 5). An increase in total energy intake by one kilocalorie increased the likelihood of being overweight or obese among the women (OR = 1.001, p = 0.019). Women with low physical activity levels were about three times more likely to be overweight or obese than those with high physical activity levels (OR = 3.136, p = 0.011). A point increase in preferred body size increased the likelihood of being overweight or obese among the women by about five times (OR = 5.197, p = 0.032). Women who were 40 years and above were about three times more likely to be overweight or obese than those who were less than 40 years (OR = 2.558, p = 0.017). Women who had at least a child were about four times more likely to be overweight or obese than those who had no child (OR = 3.878, p = 0.002).

4. Discussion

In clinical and public health management of overweight/obesity, the conventional approach has focused on the proximate modifiable aetiologic components─ diet and physical activity. However, psychosocial and socio-cultural factors have been identified to also play a role in overweight/obesity in developing societies, like Ghana. This could also represent potential intervention target.

The rate of overweight and obesity among women found in this study was comparable to that reported in the Women's Health Study of Accra (WHSA) (68.4%vs.62% respectively) [18]. The prevalence of obesity found in this study was also similar to that reported by researchers in the WHSA (37.1% vs. 34% respectively). The prevalence rate of overweight and obesity (BMI ≥ 25kg/m^2) found among the women in this study and that reported in earlier studies in Ghanaian women [13,18,19] show an increasing trend. The results were comparable to findings from elsewhere in sub-Saharan Africa [4,20,21]. Kumasi is the second largest city in Ghana after the national capital,

Accra, in terms of land area and population size [16]. Kumasi and Accra are the most developed and urbanised cities in Ghana and are hubs of commercial, industrial and educational activities. The rapid economic development, urbanisation, industrialisation and rising disposable income [14] has contributed to alterations in lifestyle. The increasingly obesogenic environment of Kumasi, acting through increasing physical inactivity and poor dietary practices, could conceivably explain the high prevalence of overweight and obesity found in this study [18]. The proliferation of cheap fast food joints and exotic soft drinks, which are usually high in total calories and fats, promote unhealthy dietary behaviour. Increasing car ownership and use of public transport (popularly known as '*trotro*') among residents has also contributed to low physical activity patterns.

It was found from this study that overweight/obese women consumed significantly more carbohydrates than low/normal weight women. However, there was no significant difference in fat and total energy intake of overweight/obese women and low/normal weight women in this study. Whilst some researchers reported similar results[22,23,24,25] as found in this study, other studies reported an association between dietary energy, dietary fat and weight gain [20,26,27,28]**.** Under-reporting of high calorie and high fat foods among overweight/obese respondents [29,30] could contribute to why there were no significant differences in total energy and fat intake between overweight/obese and low/normal weight respondents in this study. High carbohydrate intake, not total calories or fat, seems to impact on the high prevalence of overweight/obesity among the women in this study.

Respondents who were below 40 years had significantly lower carbohydrate and higher fat intake than those who were 40 years and above. Food choices and preferences are also influenced by an individual's sociocultural background and environmental factors. The population of Kumasi is predominantly Ashanti. Traditionally among the Ashantis, *fufu*, a high carbohydrate food, is the prominent diet. Preference for the traditional diet which is high in carbohydrates could still be held among the older respondents which could explain their higher intake of carbohydrates. The high fat intake of the younger respondents could reflect a more 'westernised' dietary pattern consistent with consumption of fast foods which are mostly high in fats.

There were significantly higher carbohydrate, lower fat and total energy intakes among the women with low educational status than those of high educational status in this study. The time demands of tertiary education and the accompanying white collar jobs could lead to unhealthy food habits (such as opting for fast foods and pre-packaged food products which are usually higher in calories) among the women with high education. Also, the high pay jobs which come with high level of education tend to provide women of high educational status with more financial access to larger food portions, and western exotic diets which are mostly high in fats and total calories. It was found in this study that women who had children had significantly higher carbohydrate and lower fat intake than those who had no children. Economic demands of parenting and larger family size could cause women who had children to opt for cheaper carbohydrate based diets which could contribute to their higher carbohydrate intake than those who had no children. In addition, women who had children would tend to eat home-prepared food and as such have increased tendency to have more control over their dietary fat intake than those who had no children.

The dietary pattern of the women in this study could reflect the impact of urbanisation, westernisation, increasing affluence and food market globalisation as has been observed in urban societies of some developing countries [2,5,14,31,32]. Increasing affluence is usually followed by increased food accessibility and intake of larger food portions. Urbanisation, westernisation and food market globalisation has also led to the prevalence of fast food chains and energy dense exotic soft drinks in Ghanaian communities, especially in urban communities like Kumasi. The nutritional outcome is a shift from intake of traditional diets high in complex carbohydrates, pulses and low in fats toward an increased consumption of foods high in fats, simple sugars and total calories. This situation is similar to that reported elsewhere [31] in South African populations. Thus, unhealthy dietary behaviour could impact on the high prevalence of overweight and obesity found among women in Kumasi in this study.

Results from this study show that respondents who reported low physical activity levels had higher mean BMI than respondents who reported high physical activity levels. This is consistent with previous studies which showed an inverse relationship between physical activity and weight gain [22,33,34]. In contrast, some studies found no relationship between physical activity and weight gain [36,37]. Previously, Ghanaians expended more energy from walking long distances to work and other destinations. However, today, increasing car ownership and the use of public transport in urban cities, like Kumasi, has contributed to a decrease in transport-related physical activity. Also, the increasing ownership of 24-hour multichannel television in many homes also contributes to sedentary behaviour and reduced energy expenditure. In addition, Ghanaian women in affluent homes tend to have access to energy-saving culinary devices such as blenders, graters, mashers and other devices in substitute for the energy-demanding traditional methods of cooking. This also contributes to a decrease in total physical activity. Hence, obesogenic environmental factors acting through decreasing energy expenditure could also account for the high prevalence of overweight and obesity found among women in Kumasi.

The respondents in this study correctly identified the normal size silhouette when describing normal body weight. They also understood obesity as they correctly chose an 'obese' silhouette when describing obesity. However, they equated 'overweight' with obesity as they tended to choose an 'obese' silhouette when describing overweight. This is consistent with findings from an earlier study among Senegalese women [9]. The authors found that the term 'overweight' made little sense to Senegalese women in contrast to 'obesity', and as such overweight body sizes (but not extremely obese) were seen in a positive light. The respondents in this study selected a silhouette of about an overweight size as their preferred body size. The respondents showed little dissatisfaction with their current body size. This is because the silhouette they selected as their preferred body size was not substantially different from the silhouette

they selected as depicting their current body size (overweight size). Also, the silhouette the respondents selected as their preferred body size approximated their actual BMI (overweight). They identified a normal body size as healthy. However, they preferred a large (overweight) body size. This indicates that sociocultural ideals for body size tend to have a stronger influence on their body image than health reasons. The implication is that the respondents could be less motivated to follow through recommended weight reducing therapy. Similarly, it has been documented among South African women that most of them were unconcerned about their body weight, and as such most overweight and obese women were unwilling to lose weight [38]. Unlike in western societies where obesity tend to be socially stigmatised [2], it has been reported that negative social pressure was not the motivation for African women who expressed desire to lose some excess weight to do so [39, 40]. Thus, it seems the social and cultural environment in African societies, including that of this study, tend to accommodate overweight and obesity. This could partly explain the high overweight/obesity rate found in this study, and elsewhere among African women [4,20,21].

In summary, there was a high prevalence of overweight and obesity among the women in this study. High total calorie intake, low physical activity level, being 40 years and over, and being a mother were significant predictors of overweight/obesity among the women. Body size preference was also found to be a significant predictor of overweight/obesity among the women in this study.

5. Conclusion

The prevalence of overweight/obesity was high among women in Kumasi. Dietary energy intake, low physical activity and preference for a large body size were positively associated with overweight/obesity among women in Kumasi, Ghana.

The findings from this study could have important implications for developing clinical and public health intervention strategies and programmes against the overweight/obesity problem among Ghanaian women and the general populace at large.

Nutrition education, weight management programmes and interventions among Ghanaians should encompass dietary and physical activity behaviour and also address the sociocultural dimension of body weight/size to enhance effectiveness. Clinical and public health dietitians, nutritionists, and other front-line health professionals should develop culturally competent messages that discourage obesity while associating normal body weight with healthier lifestyle. However, care should be taken to avoid stereotyping obese individuals.

More studies are required to shed more light on the sociocultural determinants of overweigh/obesity among Ghanaians. This is essential because even though sociocultural factors may not always be modifiable, they could impact on dietary and physical activity behaviour change.

Statement of Competing Interests

The authors have no competing interests.

Author Contributions

All authors worked closely together to plan and execute the study.

Collins A. Appiah: supervised data collection, literature search and write up.

Gloria E. Otoo: data analysis and write up.

Matilda Steiner-Asiedu: design of study, literature search and write up.

References

[1] Caballero B. Symposium: Obesity in developing countries: Biological and Ecological Factors. *J. Nutri*; 131: 866S- 870S. 2001.

[2] Prentice AM. The emerging epidemic of obesity in developing countries. *Int J Epidemiol;* 35: 93-99. 2006.

[3] World Health Organisation. (2003a).Global Strategy on Diet, Physical Activity & Health. Obesity and Overweight. World Health Organisation: Geneva. http://www.who.int/dietphysicalactivity/ publications/facts/obesity/en/print.html. Visited 29/05/2009.

[4] Ziraba AK, Fotso JC and Ochako R. Overweight and obesity in urban Africa: a problem of the rich or the poor? *BMC Public Health; 9:* 465. 2009.

[5] Popkin BM and Gordon-Larsen P. The nutrition transition: worldwide obesity dynamics and their determinants. *Int J Obesity;* 28: S2-S9. 2004.

[6] McLaren L. Socioeconomic status and obesity. *Epidemiol Rev;* 29: 29-48. 2007.

[7] Craig P, Halavatu V, Comino E, and Caterson I. Perception of body size in the Tongan community: differences from and similarities to an Australian sample. *Int J Obesity;* 23: 1288-1294. 1999.

[8] Pollock NJ.Cultural elaborations of obesity-Fattening practices in pacific societies. *Asia Pacific J ClinNutr;* 4: 357-360. 1995.

[9] Holdsworth M, Gartner A, Landais E, Maire B, and Delpeuch F. Perceptions of healthy and desirable body size in urban Senegalese women. *Int J Obesity*; 28: 1561-1568. 2004.

[10] Puoane T, Fourie JM, Shapiro M, Rosling L, and Tshaka NC. 'Big is beautiful'- an exploration with urban black community health workers in a South African township. *South Afri J ClinNutri;* 18(1): 6-15. 2005.

[11] Rguibi M and Belahsen R. Body size preferences and sociocultural influences on attitudes towards obesity among Moroccan Sahraoui women. *Body Image;* 3: 395-400.2006.

[12] World Health Organisation. Global Database on Body Mass Index. World Health Organisation: Geneva. 2006.

[13] World Health Organisation. Global Database. Ghana Demographic and Health Survey 2003. World Health Organisation: Geneva. 2003.

[14] Popkin BM. The nutrition transition and obesity in the developing world. *J Nutri;* 131: 871S-873S. 2001.

[15] Kumasi Metropolitan Health Profile Report. Kumasi Metropolitan District Health Directorate, Kumasi Metropolitan Assembly, Kumasi, Ghana. 2008.

[16] Kumasi Metropolitan Assembly. http://www.kma.ghanadistricts.gov.gh/. Visited 22/09/2009.

[17] Bush HM, Williams RG, Lean ME, and Anderson AS. Body image and weight consciousness among South Asian, Italian and general population women in Britain. *Appetite;* 37: 207-215. 2001.

[18] Duda RB, Darko R, Seffah J, Adanu RMK, Anarfi JK, and Hill AG. Prevalence of obesity in women of Accra, Ghana.*Afri. J Health Sci;* 14: 154-159. 2007.

[19] Amoah AG. Obesity in adult residents of Accra, Ghana. *Ethnicity and Disease;*13 (2 Suppl 2): S29-S101. 2003.

[20] Mokhtar N, Elati J, Chabir R, Bour A, Elkari K, Schlossman NP, Caballero B and Aguenaou H. Diet culture and Obesity in Northern Africa. *J Nutri;* 131: 887S-892S. 2001.

[21] Puoane T, Steyn K, Bradshaw D, Laubscher R, Fourie J, Lambert V, and Mbanga N. Obesity in South Africa: The South African Demographic and Health Survey. *Obesity Research;* 10: 1038-1048. 2002.

[22] Prentice AM and Jebb SA. Obesity in Britain: gluttony or sloth? *Br. Med. J*; 311: 437-439. 1995.

[23] Willett WC. Is dietary fat a major determinant of body fat? *Am J ClinNutr*: 67(suppl): 556S-62S. 1998.

[24] Goran MI, Shewchuk R, Gower BA, Nagy TR, Carpenter WH, and Johnson R. Longitudinal changes in fatness in white children: no effect of childhood energy expenditure. *Am J ClinNutr*; 67: 309-316. 1998.

[25] Treuth MS, Figueroa-Colon R, Hunter GR, Weinsier RL, Butte NF and Goran MI. Energy expenditure and physical fitness in overweight vs non-overweight prepubertal girls. *Int J ObesRelatMetab Disorder;* 22: 440-447. 1998.

[26] Bray GA and Popkin BM. Dietary fat intake does affect obesity! *Am. J.Clin.Nutr*; 68: 1157-1173. 1998.

[27] Lanza E, Schatzkin A, Daston C, Corle D, Freedman L, Ballard-Barbash R, Caan B, Lance P, Marshall J, Ibert F, Shike M, Weissfeld J, Slattery M, Paskett E, Mateski D and Albert P. Implementation of a 4-y, high fiber, high-fruit-and-vegetable, low-fat dietary intervention: results of dietary changes in the Polyp Prevention trial. *Am J ClinNutri;* 74(3): 387-401. 2001.

[28] Bes-Rastrollo M, Van Dam RM, Martinez-Gonzalez MA, Li TY, Sampson LL and Hu FB. Prospective study of dietary energy density and weight gain in women. *American J ClinNutr;* 88: 769-777. 2008.

[29] SW, Pisarska K, Berman ER, Pestone M, Dowling H, Offenbacher E, Weisel H, Heshka S, Matthews DE, and Heymsfield SB. Discrepancy between self-reported and actual calorie intake and exercise in obese subjects. N. *Engl. J. Med*; 327: 1893-1898. 1992.

[30] Poppitt SD, Swann D, Black AE and Prentice AM. Assessment of selective under-reporting of food intake by both obese and non-obese women in metabolic facility. *Int. J. Obesity;* 22: 303-311. 1998.

[31] Bourne LT, Langenhoven ML, Steyn K, Jooste PL, Laubscher JA, Van der Vyver E. Nutrient intake in the urban African population of the Cape Peninsula, South Africa. The Brisk Study. *Cent Afr. J Med;* 39 (12): 238-247. 1993.

[32] Monteiro CA, Benicio MHDA, Mondini L, and Popkin BM. Shifting obesity trends in Brazil. *Eur. J. Clin. Nutr*; 54: 342-346. 2000.

[33] Rissanen AM, Heliovaara M, Knekt P, Reunanen A, and Aromaa A. Determinants of weight gain and overweight in adult Finns. *Eur. J. Clin. Nutr;* 45: 419-430. 1991.

[34] JebbSA, and Moore MS. Contribution of a sedentary lifestyle and inactivity to the aetiology of overweight and obesity: current evidence and research issues. *Med Sci Sports Exerc;* 31(11):S534-541. 1999.

[35] Kaestner R. and Xu X. Effects of Title IX and Sports Participation on Girls' Physical Activity and Weight. *Advances in Health Economics and Health Services Research*; 17: 79-111. 2006.

[36] Kimm SY, Barton BA, Obarzanek E, McMahon RP, Sabry ZI, Waclawiw MA, Schreiber GB, Morrison JA, Similo S and Daniels SR. Racial divergence in adiposity during adolescence: The NHLBI Growth and Health Study. *Pediatrics;* 107(3): E34. 2001.

[37] Bogaert N, Steinbeck KS, Baur LA, Brock K, and Bermingham MA. Food, activity and family: environmental vs biochemical predictors of weight gainin children. *European J ClinNutr*.; 57 :1242-1249. 2003.

[38] Faber M and Kruger HS. Dietary intake perceptions regarding body weight and attitudes toward weight control of normal weight, overweight and obese Black females in a rural village in South Africa. *Ethnicity and Disease*; 15: 352. 2005.

[39] Sanchez-Johnsen LAP, Fitzgibbon ML, Martinovich Z, Stolley MR, Dyer AR, and Horn LV. Ethnic differences in correlates of obesity between Latin-American and Black women. *Obesity Research;* 12(4)*:* 652-660. 2004.

[40] Mvo Z, Dick J, and Steyn K. Perceptions of overweight African women about acceptable body size of women and children. *Curatonis*; 22(2): 27-31. 1999.