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PREVALENCE AND DETERMINANTS OF OVERWEIGHT AND OBESITY IN ADULT RESIDENTS OF CAPE COAST, GHANA: A HOSPITAL-BASED STUDY

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ABSTRACT

The prevalence of obesity in developing countries is more noticeable in urban areas with as much as 20-50% of the urban population of African countries estimated to be either overweight or obese. Studies investigating the prevalence of overweight and obesity in developing countries have mainly been concentrated in the capital and major cities of these countries whilst neglecting other urban settlements. It is against this background that a hospital-based cross-sectional design was employed to determine the overweight and obesity prevalence in Cape Coast, an urban settlement in the Central Region of Ghana, to identify the vulnerable groups and factors associated with the disease within this urban population. Anthropometric methods and structured questionnaire were used to determine the BMI status of 300 adults sampled from the Out Patients Department of the main hospital in the area and establish the predisposing factors of the disease in the area. Prevalence of overweight and obesity within this population was relatively high with rates of 21% and 17%, respectively. Several socio-demographic and lifestyle characteristics, and parity were found to be associated with overweight and obesity in the area. Of the socio-demographic parameters studied age, sex, occupation, marital status and ethnic origin of respondents were highly associated with overweight and obesity ($p<0.05$). Obesity prevalence increased with age with middle age adults (46-55 years) found to be most vulnerable. Females were more likely to be overweight or obese than their male counterparts ($p<0.05$). Snacking in-between meals, time of supper and lack of exercise were the lifestyle characteristics found to be associated with overweight and obesity in the area ($p<0.05$). The multivariate analysis, however, found the association with snacking and exercise to be confounded by sex and age of respondents. Exercise nevertheless remained a strong determinant of obesity in the area with respondents who did not exercise found to be about four times more likely to be obese than their counterparts who did exercise (OR = 4.174; CI = 1.886 – 9.234; $p<0.05$). A concerted effort by health professionals is thus needed to reduce the overweight and obesity burden and associated co-morbidities in this urban population.

Key words: Prevalence, Overweight, Obesity, BMI, Exercise

INTRODUCTION

With the developed world grappling with a proportionately high burden of non-communicable diseases, developing countries are experiencing a double burden of non-communicable and communicable diseases [1]. Overweight and obesity, once associated with only high income countries are now also prevalent in low and middle income countries [2,3]. The World Health Organization (WHO) in 1998 declared obesity a global epidemic and called for a coordinated effort in the management and prevention of the condition [4]. Recent global figures indicate that up to 1.6 billion adults aged 15 years and above are overweight with the number of obese adults estimated at 400 million [5]. Obesity is a well recognized risk factor for a variety of chronic conditions including cardiovascular diseases, hypertension, dyslipidemia, stroke, type 2 diabetes mellitus, certain cancers and arthritis [6,7]. Higher grades of obesity are associated with excess mortality, primarily from cardiovascular disease, diabetes, and certain cancers [6,8,9]. In developing countries, it has been suggested that over 115 million people suffer from obesity related health conditions [10,11,12].

Developing countries have undergone acculturation with alterations in dietary and physical activity patterns as a result of westernization and appear to account for the increasing prevalence of overweight and obesity in these countries [4,13]. It has been estimated that by 2025, three quarters of the obese population worldwide will be in non-industrialized countries [2]. The prevalence of obesity in developing countries is more noticeably in urban areas [5,14] with as much as 20-50% of the urban population of African countries estimated to be either overweight or obese [15,16]. In Ghana, prevalence of obesity is similarly high in urban areas of the country. A nationwide survey found overweight and obesity to be common in the more urbanized southern part of the country compared to the largely rural northern part [17]. Greater Accra Region, the most urbanized region in the country, recorded the highest prevalence rate in this survey [17]. A study conducted previously in urban and rural Accra, the capital of the country, found prevalence of overweight and obesity among adult residents to be 23.4% and 14.1%, respectively [18].

Studies investigating prevalence of overweight and obesity in developing countries have largely been concentrated in the capital and major cities of these countries whilst neglecting other urban settlements. In Ghana, almost all published studies on obesity to date have focused on residents of Accra, with prevalence of overweight and obesity in other urban areas of the country yet to be established. This study, therefore, seeks to determine the prevalence of overweight and obesity in Cape Coast, an urban settlement in the Central Region of Ghana, and to identify the vulnerable groups and associated factors of the disease within this urban population.

MATERIALS AND METHODS

Study Design and Location

The study was conducted in Cape Coast, an urban settlement and regional capital of the Central Region of Ghana using a hospital-based cross-sectional design. Cape Coast Metropolis covers an area of 122 square kilometres and was the capital of

Ghana during the colonial era. The Central Regional Hospital (CRH), which is the main health facility in the metropolis and also serves as the referral centre for medical cases in the Central Region was visited.

Study Population and Sampling Procedure

The study population comprised all adults aged 18 years and above residing in Cape Coast and attending the Out Patients Department (OPD) of CRH. Three hundred participants, 150 each of males and females were randomly selected for the study. The sampling procedure involved the assignment of numbers to all seats in the OPD and randomly selecting and labelling participating seats. An adult resident of the metropolis who visited the OPD and sat on a labelled seat was then recruited.

Anthropometric Measurements and Data Collection

The height (in cm) and weight (in kg) of the participants were measured using a stadiometer and weighing scale, respectively. Participants were asked to remove their footwear and any heavy clothing before their measurements were taken. A structured questionnaire was used to collect information on the background and demographic characteristics of the subjects and on predisposing factors of obesity.

Data Analysis and Statistical Methods

SPSS 16.0 statistical package was used to analyse the collected data. The independent sample t-test was used to compare the mean of a continuous dependent variable for two groups of an independent variable. In comparing the mean of a continuous dependent variable for three or more groups of an independent variable, a one-way ANOVA was applied, and in determining which means differ, the Tukey Post Hoc test was run. The Chi-square test was employed to investigate the association between two categorical variables. To evaluate the association between obesity and associated predisposing factors, odds ratios (OR) and their corresponding 95% confidence interval (CI) was estimated using binary logistics regression. Significance level was set at 5%.

Body mass index (BMI) was determined from the weight and height measurements of the participants as ratio of weight (kg) to square of height (m). Body mass index was categorized as follows: underweight, <18.5 kg/m^2; normal, 18.5–24.9 kg/m^2; overweight, 25–29.9 kg/m^2; and obese, ≥30 kg/m^2.

Ethical Consideration

Approval for the study was sought from the Research Committee of the University of Cape Coast School of Biological Sciences. Informed consent was obtained from each of the respondents before their participation in the study.

RESULTS

Socio-demographic characteristics and nutritional (BMI) status of respondents

Equal proportions of male and female adults were recruited for the study. Age group 18-25 years and 46-55years recorded the highest and lowest proportion of respondents, respectively. More than one-third (39%) of the subjects were educated

up to tertiary level. Respondents with no formal education were about 12%. Traders and office/administrative workers each represented about 18% of the respondents studied. More than half (54%) of the respondents were married. Majority (69%) of the respondents were of the Akan tribe and only a few (1.3%) were Hausas.

About 21% and 17% of the respondents were overweight and obese, respectively with underweight rate found to be 7.3% (Table 1). Females recorded the highest proportion of overweight and obesity cases (Table 1) with more than half (54%) of female respondents either overweight or obese compared to 22.7% of overweight and obese cases among the male respondents (Table 2). Males recorded the highest underweight cases (Table 1). Obesity rate increased with increasing age up to age 55 years whereas overweight rate remained the same for all the age groups up to age 45 years (Table 1). About 37% of respondents aged 46-55 years were obese compared to 6% obese cases among respondents aged 18-25 years (Table 2). Respondents aged 55 years and above recorded a slightly lower proportion (26.2%) of obese cases and a much lower proportion (9.5%) of overweight cases compared to respondents aged 46-55 (Table 2). Underweight rates decreased with increasing age (Table 1). Overweight and obesity rates increased with increasing educational level with tertiary educated respondents recording the highest proportions (Table 1). The highest proportions of underweight cases were also educated up to the tertiary level (Table 1).

Traders recorded the highest proportion of overweight and obese cases followed by unemployed/housewives and office/administrative workers (Table 1). Of the number of traders and unemployed/housewives in the study, more than half (59.3% and 63.6% respectively) were either overweight or obese (Table 2). About 42% of office/administrative workers were either overweight or obese (Table 2). Students recorded the highest underweight rate (Table 1). Almost three-quarters (73.1%) of obese cases were married (Table 1). Married respondents also recorded the highest proportion (66.7%) of overweight cases with single respondents recording the highest underweight cases (Table 1). Almost half (49.4%) of married respondents were either overweight or obese (Table 2). Sixty five percent of the Ga tribe respondents in the study were either overweight or obese compared to 39.2% and 30.3% overweight/obese cases among the Akan tribe and Ewe tribe respondents, respectively (Table 2).

Sex, age group, occupation and marital status of respondents were highly associated with BMI status ($p<0.05$), implying that a respondent's BMI status is dependent on his/her sex, age group, occupation and marital status (Table 3). BMI status of respondents was not dependent on their educational level or ethnic origin ($p>0.05$). The mean BMI of respondents was considerably high and falls within the overweight category (Table 4). There was a positive linear relationship between age and BMI of respondents (slope = 0.086; $p<0.05$) with every unit change in age increasing BMI by 0.086 units (Table 4).

Socio-demographic determinants of overweight and obesity

Females had a higher mean BMI compared to their male counterparts, a mean difference which was highly significant ($p<0.05$), meaning females were more likely

to be obese than males (Table 5). There was a highly significant difference in mean BMI between the respondents with respect to their age group ($p<0.05$), with mean BMI increasing with increasing age category (Table 5). The mean difference between age groups 18-25 years and 26-35 years, and age groups 26-35 years and 46-55 years was significant ($p<0.05$). Table 5 shows there is no significant difference in mean BMI of respondents defined by their educational level ($p>0.05$).

There was a highly significant difference in mean BMI of the respondents defined by their occupation ($p<0.05$) with unemployed/housewives and traders recording the highest mean BMI followed by office/administrative workers (Table 5). Traders and unemployed/housewives were more likely to be overweight or obese compared to their other counterparts ($p<0.05$) with the exception of office/administrative workers. Table 5 shows married respondents were more likely to be overweight or obese than their single counterparts ($p<0.05$). The difference in mean BMI of the respondents with respect to their ethnic origin was highly significant ($p<0.05$) with Ga respondents recording the highest mean BMI and were more likely to be overweight or obese than their Ewe counterparts ($p<0.05$) (Table 5).

Lifestyle and biological determinants of overweight and obesity

Respondents who did not smoke and those who did not drink alcohol had a marginally higher mean BMI compared to their smoking and alcohol drinking counterparts (Table 6). The mean difference was, however, not significant ($p>0.05$). Table 6 shows that respondents who did not exercise had a higher mean BMI and were more likely to be obese than their counterparts who did exercise ($p<0.05$). Respondents who snack in-between meals had slightly higher mean BMI than those who did not snack in-between meals, a mean difference which was significant ($p<0.05$). This implies that respondents who snack in-between meals were more likely to be overweight or obese than their counterparts who did not snack in-between meals (Table 6). There was no significant difference in mean BMI of those who snack 1-2 times a day and those snacking 3-4 times a day ($p>0.05$).

Respondents who reported eating prior to going to bed at night had a slightly higher mean BMI compared to respondents who did not engage in this practice (Table 6). The mean difference was, however, not significant ($p>0.05$). Respondents who ate more than three times a day had a much higher mean BMI than those who ate one to two times a day and three times a day (Table 6). The mean difference was also not significant ($p>0.05$). Table 6 shows a significant difference in mean BMI of respondents defined by the time they took supper with those taking their supper after 10pm found to have a much higher mean BMI than their counterparts who took supper before 6pm and 8pm and between 8 and 10pm ($p<0.05$). The mean difference between respondents who took supper before 6pm and 8pm and those taking supper after 10pm was significant ($p<0.05$).

Respondents with a family history of obesity had a slightly higher mean BMI than respondents with no family history of obesity; the mean difference was, however, not significant (Table 6). Female respondents who had children had a much higher mean BMI compared to their counterparts with no children (Table 6). The mean difference

was highly significant ($p<0.05$), implying female respondents who had children were more likely to be obese than their counterparts without children.

Table 7 shows the association of overweight/obesity with snacking in-between meals and lack of exercise was not significant after controlling for the confounding effect of sex and age of respondents ($p>0.05$). Table 8, however, shows that respondents who did not exercise were about four times more likely to be obese than their counterparts who did exercise (OR=4.174; CI = 1.886 – 9.234; $p<0.05$). Snacking in-between meals and parity were not associated with obesity in the logistic regression analysis.

DISCUSSION

The prevalence of overweight and obesity within this population was relatively high with rates of 21% and 17%, respectively and confirms the commonness of overweight and obesity among urban residents of developing countries as highlighted by some studies [5,14]. According to some authors [15,16], as much as 20-50% of the urban population of African countries are either overweight or obese. The prevalence estimates for our study area are comparable to the findings of a study in the Accra Metropolis [18], which estimated the prevalence of overweight and obesity to be 23% and 14%, respectively. This study found prevalence of overweight and obesity among females to be more than twice that of males with more than half of females found to be either overweight or obese. This is also similar to the findings of other studies in Ghana [17,18], South Africa [19,20], Latin America [21] and rural China [22], which have also estimated the prevalence of overweight and obesity to be higher in females than in males. According to Scidell [23], in countries with relatively low gross national product, the prevalence of obesity is about 1.5 to 2 times higher among women than men. Abubakari and colleagues [5] reported that the high prevalence of obesity in the female gender reflects the situation in all West African-origin populations around the world including those in the diaspora. Zhang *et al.* [22] has also highlighted the differences in lifestyle and socio-demographic variables, as well as other genetic or behavioural factors as possible explanation for the observed sex differences.

The study found a high proportion of males to be underweight, which is consistent with the finding of two studies [18,24], which reported significantly higher rates of underweight in adult males compared to females. According to Amoah [18], Ghanaian males tend to be involved in more physically active occupations than do females, resulting in increased energy expenditure among males. This assertion coupled with food scarcity according to the author may be partly responsible for the relatively higher levels of undernutrition among males in their study. This could explain the findings of this study especially when the Cape Coast area is well noted for food scarcity and insecurity. Students recorded the highest undernutrition rate in this study and this could be attributed to their low purchasing power as most have to rely on their parents/guardians for income and living. Also because of the scarcity of food resources in Cape Coast, food prices are high and could be beyond the reach of most students. The usually demanding and energy sapping reading and learning activities of

students could also contribute to the high underweight cases among the student respondents.

Females were more likely to be more obese than their male counterparts ($p<0.05$). In Ghana and similar sub-Saharan African countries, overweight and obesity is an indicator of beauty in women as highlighted by some authors [5,18]. According to these authors, this societal influence drives women in these countries to go all out to gain weight to appear beautiful and attractive. This could partly explain the findings of this study. As Amoah [18] puts it "Ghanaian men are generally known to prefer overweight and obese women to thin women and may conceivably contribute to the higher rates of overnutrition and consequent obesity among females". It is also well documented that women generally gain weight once they start having children and was a finding of this study with women who reported to have children found to be more likely to be obese than their counterparts without children ($p<0.05$). This could also explain the likelihood of females to be more obese than their male counterparts, especially when the proportion of female respondents who reported to have children constituted exactly one-third of the total number of respondents surveyed. Obesity rate increased with increasing age up to 55 years with more than one-third of respondents aged 46-55 years found to be obese. Studies in Ghana [17,18] also found the prevalence of obesity to increase with age up to 60 and 64 years, respectively.

Traders, office/administrative workers and unemployed/housewives recorded the highest overweight and obesity cases with traders and unemployed/housewives found to be more likely to be overweight or obese compared to their counterparts in other trades ($p<0.05$). This findings could be explained by the sedentary nature of these jobs with a consequent decrease in energy expenditure; the unlimited access to food resources by most traders; the high incomes of office/administrative workers and hence the ability to patronize energy dense and high caloric foods; and the habit of eating and sleeping locally termed "adidas" engaged in by most unemployed/housewives who are essentially at home. A study in Accra, Ghana [18] also found overweight and obesity to be high among housewives, professionals and managers. Respondents of the Ga tribe had a very high mean BMI and were more likely to be overweight or obese than their Ewe counterparts ($p<0.05$). Studies in Ghana [17,18] also found overweight and obesity rates to be highest among Ga-Adangbes. According to Biritwum and colleagues [17], Ga people largely have a sedentary lifestyle and a diet pattern that centres on kenkey; an energy dense food prepared from corn, and could explain the finding of this study.

The study found married people to be more likely to be overweight or obese than their single counterparts ($p<0.05$), which is consistent with the findings of other studies [17,25]. Most married people find themselves in stable relationships with total support from their spouses, hence are less stressed and have the mindset to eat several times a day. Also most marital homes have continuous supply of and access to food resources especially when children are present in the household, which often tends to perpetuate overeating by the household members. It is also not uncommon to find married men in Ghana and other sub-Saharan African countries with a habit of having supper late as they come home from work late and are compelled to eat the prepared meals in order

not for their wives to think they are having extramarital affairs. Also in these parts of the world, most married women are predominantly housewives with the tendency to engage in the habit of eating and sleeping. Heliovaara and Aromaa [26], also assert that single women, unlike their married counterparts, are less likely to be multiparous, which is associated with higher risk of obesity. These factors could, therefore, explain why this study found married people to be more likely to be overweight or obese than their single counterparts.

Family history of obesity was not related to obesity ($p>0.05$), contrary to the findings of several studies. Respondents who had a family history of obesity, however, had a higher mean BMI than their counterparts with no family history of obesity. Smoking and alcohol intake were also not related to obesity with respondents who do not indulge themselves in this lifestyle ironically having a higher mean BMI than their counterparts who indulged themselves in this lifestyle. Biritwum *et al.* [17] reported similar findings for smoking and overweight/obesity but found a higher proportion of people who consumed alcohol to be obese. Zhang *et al.* [22] also reported alcohol drinking to increase the risk of obesity. The ATTICA study [27] also found obese and overweight participants to consume higher quantities of alcoholic beverages compared with those of normal weight.

Snacking in-between meals, lack of exercise, and time of taking supper were found to be highly related to overweight and obesity. The association of overweight/obesity with snacking in-between meals and lack of exercise was, however, not significant after controlling for the confounding effect of sex and age of respondents. Estimating the odds ratio to evaluate the association of obesity with these associated factors, however, identified respondents who did not exercise to be about four times more likely to be obese than their counterparts who did exercise (OR = 4.174; CI = 1.886 – 9.234; $p<0.05$) with snacking in-between meals and parity paradoxically found not to be associated with obesity. A study in China [22] found moderate physical activity to decrease the risk of obesity. Similar findings regarding the association of obesity with physical activity status have also been observed in studies conducted in Australia [28] and America [29]. Lack of exercise is known to lead to positive energy balance, a situation where energy intake exceeds energy expenditure, thus resulting in weight gain and consequently obesity. It is, therefore, not surprising this study found lack of exercise to be a strong risk factor of obesity. Lankford [30] cited lack of exercise as the single most important causative factor in obesity.

CONCLUSION

The study clearly demonstrates relatively high levels of overweight and obesity among adult residents of Cape Coast attending the main health facility in the metropolis, with females and middle age adults found to be most vulnerable. Several socio-demographic and lifestyle determinants account for the high prevalence of overweight and obesity in the study area and calls for a concerted effort by health and wellness professionals to reduce the disease burden and associated co-morbidities.

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Table 1: Socio-demographic characteristics and nutritional (BMI) status of respondents

Variable	N(%)	% Under weight n=22 (7.3%)	% Normal n=163 (54.3%)	% Over weight n=63 (21%)	% Obese n=52 (17.3%)
Sex					
Male	150(50)	68.2	62.0	42.9	13.5
Female	150(50)	31.8	38.0	57.1	86.5
Age group					
18-25 years	83(27.7)	31.8	33.7	25.4	9.6
26-35 years	70(23.3)	27.3	23.9	25.4	17.3
36-45 years	64(21.3)	27.3	18.4	25.4	23.1
46-55 years	41(13.7)	9.1	8.0	17.5	28.8
>55 years	42(14.0)	4.5	16.0	6.3	21.2
Educational level					
Primary	33(11.0)	13.6	13.5	7.9	5.8
Junior High	37(12.3)	13.6	10.4	17.5	11.5
Senior High/Technical	78(26.0)	13.6	27.6	22.2	30.8
Tertiary	117(39.0)	54.5	38.7	39.7	32.7
None	35(11.7)	4.5	9.8	12.7	19.2
Occupation					
Trader	54(18.0)	9.1	12.3	23.8	32.7
Manual worker	40(13.3)	18.2	17.2	12.7	0.0
Office/Administrative worker	53(17.7)	18.2	16.6	20.6	17.3
Unemployed/ Housewife	33(11.0)	4.5	6.7	11.1	26.9
Fish monger/Farmer	24(8.0)	4.5	10.4	4.8	5.8
Skilled worker	47(15.7)	13.6	18.4	12.7	11.5
Students	49(16.3)	31.8	18.4	14.3	5.8
Marital status					
Married	162(54.0)	27.3	46.6	66.7	73.1
Single	131(43.7)	68.2	51.5	33.3	21.2
Divorced/Widowed	7(2.3)	4.5	1.8	0.0	5.8
Ethnic origin					
Akan	207(69.0)	72.7	67.5	69.8	71.2
Ewe	69(23.0)	27.3	25.8	22.2	13.5
Ga	20(6.7)	0.0	4.3	7.9	15.4
Hausa	4(1.3)	0.0	2.5	0.0	0.0

Table 2: Distribution of BMI categories of respondents by socio-demographic variables

Variable	% Underweight	% Normal	% Overweight	% Obese
Sex				
Male	10.0	67.3	18.0	4.7
Female	4.7	41.3	24.0	30.0
Age group				
18-25 years	8.4	66.3	19.3	6.0
26-35 years	8.6	55.7	22.9	12.9
36-45 years	9.4	46.9	25.0	18.8
46-55 years	4.9	31.7	26.8	36.6
>55 years	2.4	61.9	9.5	26.2
Educational level				
Primary	9.1	66.7	15.2	9.1
Junior High	8.1	45.9	29.7	16.2
Senior High/Technical	3.8	57.7	17.9	20.5
Tertiary	10.3	53.8	21.4	14.5
None	2.9	45.7	22.9	28.6
Occupation				
Trader	3.7	37.0	27.8	31.5
Manual worker	10.0	70.0	20.0	0.0
Office/Administrative worker	7.5	50.9	24.5	17.0
Unemployed/Housewife	3.0	33.3	21.2	42.4
Fish monger/Farmer	4.2	70.8	12.5	12.5
Skilled worker	6.4	63.8	17.0	12.8
Students	14.3	61.2	18.4	6.1
Marital status				
Married	3.7	46.9	25.9	23.5
Single	11.5	64.1	16.0	8.4
Divorced/Widowed	14.3	42.9	0.0	42.9
Ethnic origin				
Akan	7.7	53.1	21.3	17.9
Ewe	8.7	60.9	20.3	10.1
Ga	0.0	35.0	25.0	40.0
Hausa	0.0	100.0	0.0	0.0

Table 3: Association between socio-demographic variables and BMI categories of respondents

Variable	Chi-square (X^2) value	p value
Sex	41.30	0.000
Age group	31.24	0.002
Educational level	12.98	0.371
Occupation	48.25	0.000
Marital status	27.57	0.000
Ethnic origin	15.22	0.085

Table 4: Linear regression of BMI and age of respondents

Mean BMI ± Std Deviation	24.94±6.11
Mean Age± Std Deviation	37.68±15.25
Slope of regression line	0.086
Intercept	21.687
Coefficient of determination r^2	0.046
Correlation coefficient r	0.215
F Statistic	14.508
p value	0.000

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Table 5: Association of BMI with socio-demographic characteristics of respondents

Variable	N	Mean	Std Deviation	Test Statistic	p value	Post Hoc p value
Sex						
Male	150	22.63	3.62	-7.070	0.000	
Female	150	27.26	7.15			
Age Group						
18-25 years[1]	83	22.91	4.07	5.653	0.000	0.000[1&3]
26-35 years[2]	70	24.39	5.75			0.024[2&3]
36-45 years	64	25.60	6.91			
46-55 years[3]	41	27.90	6.89			
>55 years	42	25.99	6.69			
Educational Level						
Primary	33	23.881	6.4921	1.792	0.130	
Junior High	37	24.961	5.4926			
Senior High/Technical	78	25.562	6.9385			
Tertiary	117	24.228	5.1332			
None	35	26.930	7.1032			
Occupation						
Trader[1]	54	28.205	7.6609	9.337	0.000	0.000[1&2]
Manual worker[2]	40	22.291	3.1478			0.006[1&3]
Office/Administrative worker	53	25.232	5.3603			0.002[1&4] 0.000[1&5] 0.000[2&6]
Unemployed/Housewife[6]	33	28.877	7.6027			0.004[3&6]
Fish monger/Farmer[3]	24	23.171	4.2019			0.002[4&6]
Skilled worker[4]	47	23.768	5.0800			0.000[5&6]
Students[5]	49	22.540	4.4506			
Marital status						
Married[1]	162	26.530	6.6704	13.960	0.000	0.000[1&2]
Single[2]	131	22.910	4.6407			
Divorced/Widowed	7	26.221	6.5223			
Ethnic origin						
Akan	207	25.207	6.5171	3.531	0.015	0.037[1&2]
Ewe[1]	69	23.616	4.5661			
Ga[2]	20	27.744	5.7002			
Hausa	4	20.110	1.6642			

Table 6: Association of BMI with lifestyle characteristics and biological history of respondents

Variable	N	Mean	Std. Deviation	Test Statistic	p value	Post Hoc p value
Family history of obesity						
Yes	51	25.39	5.88	0.568	0.570	
No	249	24.85	6.17			
Parity						
Yes	100	29.97	7.11	7.762	0.000	
No	50	21.84	2.91			
Smoking						
Yes	19	22.95	4.21	-1.471	0.142	
No	281	25.08	6.20			
Alcohol intake						
Yes	41	23.20	4.28	-1.969	0.050	
No	259	25.22	6.32			
Snacking in between meals						
Yes	138	25.76	6.87	2.155	0.032	
No	162	24.24	5.32			
Snacking frequency						
1-2 times per day	74	24.50	6.27	-0.217	0.829	
3-4 times per day	64	24.74	6.58			
Eating prior to bed						
Yes	44	26.45	6.77	1.778	0.076	
No	256	24.68	5.97			
Exercise						
Yes	115	23.36	4.58	-3.612	0.000	
No	185	25.93	6.73			
Number of meals eaten per day						
One-two	58	24.71	5.49	2.455	0.088	
Three	234	24.84	6.04			
More than three	8	29.64	10.61			
Time of supper						
Before 6 to 8pm[1]	220	24.39	5.57	5.686	0.004	0.008[1&2]
Between 8 and 10pm	69	25.90	7.20			
After 10pm[2]	11	30.01	6.65			

Table 7: Association of BMI with lifestyle characteristics and biological history of respondents after adjusting for effect of sex and age of respondents

Variable	F Statistic	p value
Snacking	**0.003**	**0.956**
Sex	39.17	0.000
Age group	16.02	0.000
Lack of exercise	**1.68**	**0.196**
Sex	36.96	0.000
Age group	17.24	0.000
Parity	**46.47**	**0.000**
Age group	8.54	0.004
Time of supper	**4.20**	**0.016**
Sex	41.47	0.000
Age group	20.37	0.000

Table 8: Binary logistic regression of obesity and associated lifestyle and biological determinants

Variable	Odds Ratio	Confidence Interval	p value
Family history of obesity	1.154	0.507 - 2.624	0.733
Smoking	1.840	0.412 – 8.218	0.425
Alcohol intake	2.104	0.716 – 6.185	0.176
Snacking in between meals	0.382	0.205 - 0.714	0.003
Eating prior to bed	0.785	0.352 - 1.752	0.555
Lack of exercise	4.174	1.886 – 9.234	0.000
Late supper (After 8pm)	1.765	0.936 – 3.328	0.079
Parity	0.026	0.003 - 0.196	0.000

REFERENCES

1. **Lopez A, Mathers C, Ezzati M, Jamison D and C Murray** Global Burden of disease and risk factors. New York: Oxford University Press 2006.

2. **WHO.** Preventing chronic diseases, a vital investment. Geneva: World Health Organization 2005.

3. **Campbell T and A Campbell** Emerging disease burdens and the poor in cities of the developing world. *J Urban Health* 2007; **84(3):**i54-64.

4. **WHO.** Obesity: Preventing and Managing the Global Epidemic. WHO Technical Report Series No. **894.** Geneva: World Health Organisation 1998.

5. **Abubakari AR, Lauder W, Agyemang C, Jones M, Kirk A and RS Bhopal** Prevalence and time trends in obesity among adult West African populations: a meta-analysis. *Obes Rev* 2008; **9(4):**297–311.

6. **Malnick SD and H Knobler** The medical complications of obesity. *QJM* 2006; **99(9):**565-579.

7. **Asfaw A** The effects of obesity on doctor-diagnosed chronic diseases in Africa: empirical results from Senegal and South Africa. *J Public Health Policy* 2006; **27(3):**250-264.

8. **Flegal KM, Graubard BI, Williamson DF and MH Gail** Cause-specific excess deaths associated with underweight, overweight, and obesity. *JAMA* 2007; **298(17):**2028-2037.

9. **Orpana HM, Berthelot JM, Kaplan MS, Feeny DH, McFarland B and NA Ross** BMI and mortality: results from a national longitudinal study of Canadian adults *Obesity (Silver Spring)* 2009; doi: **10.1038/oby.2009.191.aa.**

10. **WHO.** Obesity and overweight Fact Sheet Geneva: WHO 2004. www.who.org\Papers\Obesity\WHOObesity and overweight.htm Accessed May 2010.

11. **McLellan F** Obesity rising to alarming levels around the world. *Lancet* 2002; **359(9315):**1412.

12. **Walker AR, Adam F and BF Walker** World pandemic of obesity: the situation in Southern African populations. *Public Health* 2001; **115:**368-372.

13. **Popkin BM** The nutrition transition in low income countries: an emerging crisis. *Nutr Rev* 1994; **52:**285–298.

14. **Martorell R, Khan LK, Hughes ML and LM Grummer-Strawn** Obesity in women from developing countries. *Eur J Clin Nutr* 2000; **54(3):**247-252.

15. **Kamadjeu RM, Edwards R, Atanga JS, Kiawi EC, Unwin N and JC Mbanya** Anthropometry measures and prevalence of obesity in the urban adult population of Cameroon: an update from the Cameroon Burden of Diabetes Baseline Survey. *BMC Public Health* 2006; **6:**228.

16. **Sodjinou R, Agueh V, Fayomi B and H Delisle** Obesity and cardiometabolic risk factors in urban adults of Benin: relationship with socio-economic status, urbanisation, and lifestyle patterns. *BMC Public Health* 2008; **8:**84.

17. **Biritwum R, Gyapong J and G Mensah** The epidemiology of obesity in Ghana. Ghana Med J 2005; **39:**82–85.

18. **Amoah AGB** Sociodemographic variations in obesity among Ghanaian adults. *Public Health Nutr* 2003; **6(8):**751–757.

19. **van der Merwe MT and MS Pepper** Obesity in South Africa. *Obes Rev* 2006; **7:**315–322.

20. **Puoane T, Steyn K, Bradshaw D, Laubscher R, Fourie J, Lambert V and N Mbananga** Obesity in South Africa. The South African demographic and health survey. *Obes Res* 2002; **10:**1038–1048.

21. **Uauy R, Albala C and J Kain** Obesity trends in Latin America: transiting from under to overweight. *J Nutr* 2001; **131:**S893–S899.

22. **Zhang X, Sun Z, Zhang X, Zheng L, Liu S, Xu C, Li J, Zhao F, Li J, Hu D and Sun Y** Prevalence and associated factors of overweight and obesity in a Chinese Rural Population. *Obesity* 2008; **16:**168–171.

23. **Scidell JC** Epidemiology of obesity. *Semin Vasc Med* 2005; **5:**3–14.

24. **Steyn K, Bourne L, Jooste P, Fourie JM, Rossouw K and C Lombard** Anthropometric profile of a black population of the Cape Peninsula in South Africa. *East Afri Med J* 1998; **75:**35–40.

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

26. **Heliovaara M and A Aromaa** Parity and obesity. *J Epidemiol Community Health* 1981; **35(3):**197-199.

27. **Panagiotakos DB, Pitsavos C, Chrysohoou C, Risvas G, Kontogianni MD, Zampelas A and C Stefanadis** Epidemiology of overweight and obesity in a Greek adult population: the ATTICA study. *Obes Res* 2004; **12:**1914–1920.

28. **Cameron AJ, Welborn TA, Zimmet PZ, Dunstan DW, Owen N, Salmon J, Dalton M, Jolley D and JE Shaw** Overweight and obesity in Australia: the 1999–2000 Australian Diabetes, Obesity and Lifestyle Study (AusDiab). *Med J Aust* 2003; **178:**427–432.

29. **Flegal KM, Carroll MD, Ogden CL and CL Johnson** Prevalence and trends in obesity among US adults, 1999–2000. *JAMA* 2002; **288:**1723–1727.

30. **Lankford TR** Foundations of normal and therapeutic nutrition. 2nd Edition. Albany, New York: Delmar Publishers Inc 1994.