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**Original Research Article**

# Prevalence and risk factors of obesity among senior high school students in the Adansi North district of Ghana

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## ABSTRACT

**Background:** Obesity is one of today's noticeable yet neglected public health problem with serious health consequences such as hypertension, type 2 diabetes that affect individuals of all ages globally. Adolescents are particularly prone to obesity owing to their reduction in physical activity. This study was to determine the prevalence and risk factors of obesity among Senior High School Students in the Adansi North District of Ghana.
**Methods:** A descriptive cross- sectional survey was conducted among 306 adolescents aged 12- 19 years. The adolescents were recruited from the five senior high schools in the district using stratified random sampling technique. Data was collected by the use of structured questionnaire and anthropometric data sheet to calculate for BMI levels. STATA version 11.1, and Microsoft Excel was used to analyze the data collected.
**Results:** Results from the chi-square test indicated that, there was a significant relationship between leisure activities and obesity such as playing computer games ($x^2$=7.5086, df=9, p<0.05), and TV watching ($x^2$=6.3576, df=2, p<0.05). A significant relationship was between food consumption pattern and obesity ($x^2$=21.6181, df=9, p<0.05). Overall prevalence of obesity among the adolescents was found to be 47.06%.
**Conclusions:** The study concludes that, the prevalence of obesity among the adolescents in the district is quite high compared to rates in some developed countries. There is the need to plan for the most efficient and effective interventions not only to ensure food security, but also maintain healthy lifestyles, so as to reduce the prevalence of obesity among the adolescents in the district and in Ghana as a whole.

**Keywords:** Obesity, Prevalence, Risk factors, Adolescents

## INTRODUCTION

Obesity refers to as an abnormal or excessive accumulation of body fat which may be harmful to health.[1,2] Evidence shows that before the 20th century, obesity was rare. However, in the year 1997, the World Health Organization (WHO) recognized obesity as an international phenomenon and consequently described its increasing prevalence across all age groups in the world as a 'global epidemic'.[3] The WHO has also noted that, obesity has contributed to the high rising prevalence of non-communicable diseases (NCDs) such as heart diseases, type 2 diabetes, hypertension, stroke, and certain cancers along the range of life.[4] Currently, there are about 20-50% of urban population in Africa that are classified as either overweight or obese and that by 2025, three quarters of the obese population worldwide will be in non-industrialized countries of which Ghana is of no exception.[5]

In Africa, the increasing rate of obesity has been attributed to many factors such as sedentary lifestyles, consumption of more saturated fat foods, salt, sweets, and beverages which have high energy value.[6-8] Increase sedentary nature of daily activities as well as physical inactivity are serious threats to the body since they increase the risk of overweight and obesity thereby affecting the normal body function and work output.[9] Obesity is on the increase in Ghana. The Ghana Demographic and health Survey, shows high prevalence among women and Dake, confirmed this on secondary data analysis.[10]

Studies conducted among the preschool children from numerous African countries revealed that, South Africa had an incidence rate of 31.9%, Algeria 21.6%, Seychelles 25%, Malawi 8.4%, Mauritius 5.6% and Kenya 4.6%.[11] However, there are inadequate data available from African countries for studying the developments of adolescents' obesity.[12] Prevention is the only viable choice for decreasing this epidemic since current treatment practices for obese adolescents and children are mainly focused on bringing the problem under control rather than effecting a cure.[13]

Therefore, if this problem is curtailed, we will not only prevent the transition of adolescents' obesity to adulthood but also health related problems linked to obesity will be prevented hence increasing the life expectancy of these adolescents. Availability of data on adolescents' obesity is inadequate not only in Africa, but in Ghana also. As a result, the study sought to generate knowledge on the prevalence and risk factors of obesity among adolescents' in Senior High Schools in the Adansi North District of Ghana.

### *Statement of problem*

Contrary to the previous view that obesity was a condition found in the developed countries, current studies are now reporting that the problem is steadily increasing in developing countries of which Ghana is no exception.[14,15] Obesity is a condition viewed differently across cultures. Most developed countries, despise obesity but for most African cultures including Ghana fat women are seen as beautiful.[10,16] In some sub-Saharan African countries, there is a cultural importance of fatness which is a sign of prosperity, health, beauty and prestige. It even signifies strength and makes one look respectable in society.[17-20] Thinness on the other hand, is mainly associated with poverty and illness, and drastic weight loss is presumed to be HIV/AIDS.[19,21,22]

Though most African societies associate wealth and prestige to body mass or size, the implication of this condition on the health of people seems to be unknown especially where it has been linked to other diseases such as diabetes, stroke and among others. The focus on senior high school students was significant to study, because as one ages the rate of obesity increases, hence examining the risk factors accounting for the prevalence of obesity will go a long way to tackling the problem.

For instance, the work of Amoah in both urban and rural Accra revealed that the overall prevalence of overweight and obesity was 23.4% and 14.1% respectively.[23] This was among adults aged 25years and above. The rates were reported to be higher in females than in males. Against this backdrop, a study at the senior high school level was crucial to curtail the prevalence rate of obesity at adult years. Being aware of the risk factors accounting for the prevalence rate of obesity in Ghana, will help in finding ways of combating the condition.

Specific objectives were

- To determine the prevalence of obesity among SHS students in the Adansi North district.
- To assess the physical activity levels of SHS students in the Adansi North district.
- To assess the food consumption pattern of SHS students in the Adansi North district.
- To establish any relationship between independent variables and obesity.

## METHODS

### *Research design*

The study adopted a quantitative research methodology. Quantitative method attempt to maximize objectivity, reliability, replicability and generalizability of findings and are typically interested in prediction.[24-26] Descriptive cross- sectional design was used in the study. With a cross-sectional design, participants are assessed at a single point in time. Its significance is that, it is less time consuming since it involves testing several groups at the same point in time hence a large number of subjects can be tested at a little cost.[27]

### *Methods of data collection*

The study made use of only primary data source. This was obtained through self-administered questionnaire. In this method, the respondent completed the survey questionnaire themselves. It was used because, it allowed the respondents to complete the questionnaire at their convenience. The method also enabled the researcher to translate questions into Asante Twi for some students and provided clarification on some questionnaire items to them where it was needed.

### *Anthropometric data sheet*

The heights and weights of the adolescents were taken and recorded on the anthropometric data sheet. Each adolescent height was taken using height board. The weight measurements were also taken by the use of bathroom scale which was highly reliable. This enabled the researcher to calculate for the BMI levels to ascertain the prevalence of obesity among the students.

***Study population***

The study population comprised of adolescents from Adansi North Senior High Schools, including both males and females. From the population, adolescents aged 12-19 years formed the target population. It was chosen because several studies conducted globally have revealed that, obesity management at a tender age has greater effect than in adulthood because body fat starts to increase at this stage.[23,28]

***Sampling procedure***

All the five schools in the district participated in the study. Since their classes constituted specific strata (SHS 1, SHS 2, SHS 3), the study used a multi-stage sampling method involving stratified random sampling and simple random techniques to select adolescents who participated in the study. Only the Form 1s and the Form 2s were sampled for the study since the Form 3s had completed school at the time of the study. In all, a total of 306 students were recruited to participate in the study. This method was appropriate because it allowed each adolescent to have an equal chance of being included in the sample.[26] The study was conducted in November 2014 to September 2015.

***Analysis of data***

The data analysis was done using STATA version 11.1. The data was analyzed using basically descriptive statistics involving mainly frequency distributions and cross tabulations. Microsoft Excel was used to analyze the anthropometric data in order to determine the BMI which was graded according to IOTF, age specific cut-off points for adolescents.[12] Chi square statistical test was carried out to consider whether the relationship between the independent variables and the dependent variable was significant at 0.05 level of significance.

## RESULTS

***Demographic characteristics of the respondents***

The total sample size was 306. Out of this, 147 respondents representing 48.06% were females whilst 159 representing 51.96% were males. The mean age of the respondents was 17.288 with standard deviation of ±1.129. The age distribution showed that, all the respondents were of school going age. 169 (55.23%) of the participants were in Form 2 whilst 137 (44.77%) were in form 1 (Table 1).

***Prevalence of obesity among the students***

BMI is a recognized standard of measurement for obesity among all age groups and has strong association with body fatness and health risk.[29] The results were categorized based on the WHO standard as indicated in Table 2. Majority 47.06%, of the participants were obese. Most of the obese participants were in class one obesity range (30-34.99 kg/m$^2$). 33.66% were overweight whilst 13.40% were normal (Table 2).

**Table 1: Demographic characteristics of the respondents.**

| Variable | Total (n=306) (%) | |
|---|---|---|
| **Sex** | | |
| Female | 147 (48.08) | |
| Male | 159 (51.96) | |
| **Age** | | Mean age |
| 14 | 2 (0.65) | 17.288 ±1.129 |
| 15 | 18 (5.88) | |
| 16 | 49 (16.0) | |
| 17 | 106 (34.64) | |
| 18 | 83 (27.1) | |
| 19 | 48 (15.69) | |
| **Class** | | |
| Form 1 | 137 (44.77) | |
| Form 2 | 169 (55.23) | |
| **Number of siblings** | | |
| Normal 1-3 | 83 (27.12) | |
| Moderate 4-6 | 159 (51.96) | |
| Heavy/rich >7 | 64 (20.92) | |
| **Residence** | | |
| Rural | 115 (37.58) | |
| Urban | 191 (62.24) | |
| **Income level of parents** | | |
| Poor 1-3 | 93 (30.39) | |
| Middle 4-6 | 195 (63.73) | |
| Rich 7-9 | 18 (5.88) | |

Source, Author's Field Data, 2015

**Table 2: Prevalence of obesity among the adolescents.**

| BMI | Total (n=306) (%) |
|---|---|
| **Underweight** | 18 (5.88) |
| **Normal** | 41 (13.40) |
| **Overweight** | 103 (33.66) |
| **Obese** | 144 (47.06) |

Source, Author's field data, 2015

***Dietary practices of the respondents***

*Meals skipped by respondents*

The study showed that, 34.31% of the respondents skipped breakfast, lunch or supper whilst 65.69% did not skip meals in a day. Reasons for skipping meals were given by respondents as; No food at home, No time for eating, lack of appetite and illness.

*Snacks consumed in between meals by respondents*

Snacks included; refined fruit juice, soda, and non-alcoholic drinks. Majority of the respondents 65.36% consumed snacks in between meals whilst 34.64% did not consume snacks in between meals. This was an

indication that, most of them were not keen on the nutritive value of snacks that they consumed. In all the schools visited, it was observed that, most of the snacks sold were predominantly sugar in nature (Table 3).

***Relationship between leisure activity and obesity***

A Chi square test of association was performed to check whether the relationship between leisure activity and obesity was statistically significant. The test indicated that, a significant relationship exist between playing with computer and obesity ($x^2$=7.5086; df=9; p<0.029). There was also a significant relationship between obesity and TV watching ($x^2$= 6.3576; df=2; p<0.011). However, there were no significant relationship between playing games and assisting in household chores and obesity (Table 4).

**Table 3: Dietary practices of the respondents (n=306).**

| Variables | N (%) |
|---|---|
| **Eating occasions** | |
| Anytime | 53 (17.32) |
| Once | 4 (1.31) |
| Three | 192 (62.75) |
| Twice | 57 (18.63) |
| **Meals skipped** | |
| No | 201 (65.69) |
| Yes | 105 (34.31) |
| **Snack consumption in between meals** | |
| No | 106 (34.64) |
| Yes | 200 (65.36) |

Source, Author's field data, 2015.

**Table 4: Cross tabulation and chi square analysis between leisure time and obesity.**

| Variables | Weight status | | | | |
|---|---|---|---|---|---|
| **Leisure activity at home** | **Underweight** | **Normal** | **Overweight** | **Obese** | **P value** |
| **Assisting in household chores** | 2 (11.11) | 8 (19.51) | 24 (23.3) | 37 (25.69) | 0.751 |
| **Playing** | 2 (11.11) | 5 (12.2) | 17 (16.5) | 15 (10.42) | 0.932 |
| **Playing with computer >4 hours** | 2 (11.11) | 7 (17.07) | 20 (19.42) | 31 (21.53) | 0.029* |
| **Watching TV >4 hours** | 12 (66.67) | 21 (51.22) | 42 (40.78) | 61 (42.36) | 0.011* |
| **Total** | 18 | 41 | 103 | 144 | 306 |

Notes; Significance level= 0.05; Significance level p< 0.05, Not significance p> 0.05. Source, Author's field data, 2015.

**Table 5: Cross tabulation and chi square analysis of socio economic status (income level of parents) and obesity.**

| Variables | Weight status | | | | |
|---|---|---|---|---|---|
| **Income level of parents** | **Underweight** | **Normal** | **Overweigh** | **Obese** | **P value** |
| **Poor 1-3** | 1 (50.0) | 13 (40.63) | 11 (29.91) | 68 (30.09) | |
| **Middle 4-6** | 1 (50.0) | 19 (59.38) | 29 (63.04) | 146 (64.60) | 0.0216 |
| **Rich 7-9** | 0 (0.00) | 0 (0.00) | 6 (13.04) | 12 (5.31) | |
| **Total** | 2 | 32 | 46 | 226 | 306 |

Notes; $x^2$ (df)= 8.3187 (6) P- value =0.0216, Significance level= 0.05 Significance level p< 0.05, Not Significance P> 0.05. Source; Author's field data, 2015.

***Relationship between socio economic status (income level of parents) and obesity***

A Chi square test of association between socio economic status (income level of parents) and obesity was also statistically significant ($x^2$=8.3187; df=6; p<0.0216) at 0.05 level. Most of the adolescents from both rich and poor homes were obese. It is an indication that, they consumed high energy dense and fats foods which easily predispose them to obesity (Table 5).

***Relationship between socio economic status (place of residence) and obesity***

A Chi square test of association again showed a significant relationship between socio economic variable (place of residence), and obesity ($x^2$=9.3025; df=3; p<0.026). Majority of the obese adolescents were living in urban communities (Table 6).

**Table 6: Cross tabulation and chi square analysis between socio economic status (place of residence) and obesity.**

| Variables | Weight status | | | | |
|---|---|---|---|---|---|
| **Place of residence** | **Underweight** | **Normal** | **Overweight** | **Obese** | **P value** |
| **Rural** | 11 (61.11) | 21 (51.22) | 36 (34.95) | 47 (32.64) | 0.026 |
| **Urban** | 7 (38.89) | 20 (48.78) | 67 (65.05) | 97 (67.36) | |
| **Total** | 18 | 41 | 103 | 144 | 306 |

Notes; $(\times)^2$ (df)= 9.3025 (3) P value=0.026, Significance level= 0.05 significance level p<0.05, Not significance p>0.05.
Source, Author's Field Data, 2015

**Table 7: Cross tabulation and chi square analysis of food consumption pattern and obesity**

| Variable | Weight status | | | | |
|---|---|---|---|---|---|
| **Eating occasions** | **Underweight** | **Normal** | **Overweight** | **Obese** | **P value** |
| **Anytime** | 8 (44.44) | 7 (17.07) | 16 (15.53) | 22 (15.28) | 0.010 |
| **Once** | 1 (5.56) | 0 (0.00) | 3 (2.91) | 0 (0.00) | |
| **Three** | 6 (33.33) | 22 (53.66) | 67 (65.05) | 97 (67.36) | |
| **Twice** | 3 (16.67) | 12 (29.27) | 17 (16.50) | 25 (17.36) | |
| **Total** | 18 | 41 | 103 | 144 | 306 |

Notes; ($x^2$) (df)= 21.6181(9) P value =0.010, significance level= 0.05; significance level p<0.05, Not significance p>0.05; Source, Author's field data, 2015

***Relationship between dietary practices (food consumption pattern) and obesity***

A Chi square test of association found the relationship between dietary practices and obesity to be statistically significant ($x^2$=21.6181; df=9; p<0.010) at 0.05 significance level. Their meals consumed were either imbalance diet or were of high energy dense or rich in fats (Table 7).

## DISCUSSION

***Prevalence of obesity among the adolescents***

The study recorded a high prevalence of obesity among the adolescents. This may be owing to cultural predisposition of Ghanaians to see obesity as a symbol of prosperity, well-being, and beauty.[20] As a result, Parents therefore do not make any conscious effort to improve their wards obesity status, but rather encouraging its worsening. The overall prevalence rate of this study was 47.06%. This rate was higher than earlier study done by Abachinga, which reported 19.3% prevalence in Legon and Achimota School going children.[30] The rate is very high and confirms the literature explanation of an increasing prevalence of obesity in unindustrialized nations.[11,31,32] This shows an increased tendency of worsening future trends of adolescent obesity with its associated problems making it an essential public health concern in the study participants. Most of the adolescents perceived themselves as being obese but, see their weights as a symbol of good living. The finding was in agreement with the work of Ntui who recorded that, certain societies thought and still think that fatness is an index of beauty.[33]

***Physical activity and leisure time activities***

According to Murrary, it is essential to nurture skills in organized sports particularly at a tender age as they easily mastered at a younger age than in adulthood.[34] Murray further reckons that, sports should not be gender specific. 50% of the adolescent in this study reported that they rarely participate in sporting activities investigated.

Adolescent should be taught both at home and in school the benefit of being physically fit. 42.36% of the respondents spent their time watching TV, 21.53% also spent their time playing computer games. It was observed that, majority of the adolescents who spent their time watching TV and playing computer games were boys whilst the girls spent their time carrying out household activities. This can be associated to the proportion of girls who were obese being low in this study. Results from this study indicate that, adolescents who spent their time playing computer or video games and watching TV highly consumed snacks. Parents should discourage eating and watching TV as this increases their chances of taking more calories than what the body needs. Additionally, they should restrict time spent on sedentary activities and involve them in physical activity in the house.

***Consumption of energy dense foods***

It was noted by Wabitsch that, food remains the main factor for the development of a person throughout his or her growing years.[35] The environment in which a person lives can also determine the food behavoiur and quality of nutrition. The age category of respondents shows that, they were still in the stage of growth and development. They required nutrients from all the five groups of food

sources. Regarding the consumption of energy dense foods, the finding of the study saw that majority of the adolescents reported the consumption of energy dense food at least once in the course of the previous school day. In general, this finding seem to corroborate with the ideas of Popkin, that the lifestyle in most developing countries increasingly includes the consumption of energy dense foods (EDF) and beverages that are more in sugar, fat, salt, and less of staple foods and drinks.[36] Furthermore, the findings suggest that, the consumption of energy dense foods might have displaced the consumption of dietary items such as water and vitamins which have a lower energy content.[37] The displacement of healthier dietary options by energy dense ones is characteristic of nutrition transition.[36]

***Poor eating habits among the adolescents***

As noted by Prentice and Jebb, snacking and consumption of foods dense in fat are the common practices that predispose adolescents to obesity.[37] In this study, most of the respondents reported that, they consumed snack in between meals, these food items were dense in fat content which if consumed in excess will have an adverse effect on their health. 65.36% of the adolescents consumed snacks because they could easily afford to buy those snacks. Majority of the adolescents who were obese highly consumed snacks, whilst those who had normal weight mostly consumed less snacks. An analysis done on the food of preschool children in USA showed a positive relationship between dietary fat and energy density and the reciprocal relationship with carbohydrates.[38] High consumption of fats and carbohydrates as snacks, delay meal by about thirty five minutes while protein snacks delay meals by about sixty minutes. Good habits are best started early therefore, parents should encourage their adolescents to consume healthy snacks such as whole fruits, fresh vegetables, fresh fruit juices and sugar free biscuits.

Consumption of water should also be highly encouraged. Allow adolescents to adapt a regular eating pattern and avoid random eating as this could make them to consume large amounts of junk foods and soft drinks that are dense in sugar and fats. Skipping meals can also generally affect the eating behaviour of an individual, which could result in less food intake or excessive food consumption. As noted by Bertone, diets are essential and every diet in a day must be taken, however breakfast which is the first diet in the day should not be skipped because it is linked to decrease fat intake and decrease snacking later in the day.[39] Despite the mothers having a busy schedules, they should try and at least have time for their wards; plan and prepare meals together, go for shopping together with their adolescents and let them make choices of food with guidance, eliminate unhealthy foods from the house and avoid preparing high fat and convenient foods. This will not only enable them to attain knowledge but also skills. This also enables them to grow up into responsible individuals who value a healthy lifestyle.

## CONCLUSION

The study concludes that, the prevalence rate of obesity among the adolescents was significantly high which was 47.06%. This predisposes the adolescents to certain chronic diseases such as type 2 diabetes whose rate among the adolescents is going up. This means that, a rise in the prevalence rate of obesity, also means a rise in the incidence of comorbidities linked to obesity. The rate was high among both the low and high income classes. A predominance of physical inactivity was found to be one of the major contributors of obesity among the adolescents. It was observed that, the adolescents used their leisure time playing computer games or watch TV. Even some of the parents restrict their adolescents to go out and play with their neighbours hence the child being forced to frequent playing of computer games or watching TV. It is recommended by WHO that, adolescents and children aged 5-19 years should engage in at least 60 minutes of aerobic activities at a moderate intensity daily.[40] This is because, the more the amount of time spent on exercise, the lower the rate of obesity among the adolescents and vice- versa.

Dietary habit of diet skipping, greater accessibility of foods void of nutritional value as well as less dietary intake of fruits and vegetables was also found to be major contributors of obesity among the adolescents. Most of the adolescents consumed snacks and foods which contain too much fats and carbohydrates. It has been established by WHO that, the more the amount of carbohydrates and fats meals consumed in a day, the higher the rates of obesity and the more the amount of fruits and vegetables consumed in a day, the less the rates of obesity across all ages.[40]

***Recommendations***

- Intensive education on good nutrition should be provided to both parents and adolescents so that, prudent choices of foods will be made when selecting meals and snacks.
- Regular consumption of fruits and vegetables should be well encouraged by parents to their children daily.
- The Ghana Education Service should include nutrition education in the curriculum of SHS to provide students with right information and advice, which will enable them to understand the consequences of obesity so as to eat healthy diets
- The Ghana Health Service specifically Adansi North District Health Directorate under the Ministry of Health should pay regular visits to the schools to educate them on the causes of obesity and its complications, and place posters throughout the schools showing foods rich in various nutrients.
- Policy makers in the country should deliberately increase the prices of unhealthy foods (chocolates, cakes, fried rice etc.) in order to put adolescents off from buying them since they usually prefer those foods.

- Parents and teachers should highly encourage adolescents to drink water frequently.

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## REFERENCES

1. WHO. Global health risks: mortality and burden of disease attributable to selected major risks. World Health Organization; 2009.
2. Callaway LK, O'Callaghan M, David McIntyre H. Obesity and the hypertensive disorders of pregnancy. Hypertension Pregnancy. 2009;28(4):473-93.
3. WHO. Overweight and Obesity Fact sheet N311, 2006.
4. WHO. Global status report on non- communicable diseases 2010, 2011.
5. Kamadjeu RM, Edwards R, Atanga JS, Kiawi EC, Unwin N, Mbanya J-C. 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(1):228.
6. Caballero B. The global epidemic of obesity: an overview. Epidemiologic Reviews. 2007;29(1):1-5.
7. Prentice AM. The emerging epidemic of obesity in developing countries. Intern J Epidemiol. 2006;35(1):93-9.
8. Agyei-Mensah S, Aikins Ad-G. Epidemiological transition and the double burden of disease in Accra, Ghana. J Urban Health. 2010;87(5):879-97.
9. Ogunjimi L, Ikorok MM, Olayinka Y. Prevalence of obesity among Nigeria nurses: the Akwa Ibom State experience. Int NGO J. 2010;5(2):45-9.
10. Dake FA, Tawiah EO, Badasu DM. Sociodemographic correlates of obesity among Ghanaian women. Public Health Nutrition. 2011;14(07):1285-91.
11. Ziraba AK, Fotso JC, Ochako R. Overweight and obesity in urban Africa: A problem of the rich or the poor? BMC Public Health. 2009;9(1):465.
12. IOTF. International obesity Task Force Data. Based on population weight estimates from published and unpublished survey. (1990-2002). London. 2002: 14-17.
13. Cole T, Paul A, Whitehead R. Weight reference charts for British long-term breastfed infants. Acta Paediatrica. 2002;91(12):1296-300.
14. Akinkugbe O, Oladipo O. Epidemiology of cardiovascular disease in developing countries. J Hypert, Int J Epidemiol. 1990;8:5233-8.
15. WHO. Global action plan for the prevention and control of non-communicable dieseases. Available at: http://apps.who.int/iris/bitstream/10665/94384/1/9789241506236 eng.pdf? au=1. 2013a. Accessed on 5 July 2015.
16. Holdsworth M, Gartner A, Landais E, Maire B, Delpeuch F. Perceptions of healthy and desirable body size in urban Senegalese women. Int J Obesity. 2004;28(12):1561-8.
17. Renzaho AM, McCabe M, Swinburn B. Intergenerational differences in food, physical activity, and body size perceptions among African migrants. Qualitative Health Res. 2012;22(6):740-54.
18. Puoane T, Tsolekile L, Steyn N. Perceptions about body image and sizes among black African girls living in Cape Town, 2010.
19. Shaibu S, Holsten JE, Stettler N, et al. Adolescent Obesity Prevention in Botswana Beliefs and Recommendations of School Personnel. J School Nursing. 2012;28(3):220-9.
20. Amoah AG. Sociodemographic variations in obesity among Ghanaian adults. Public Health Nutr. 2003;6(08):751-7.
21. Kruger HS, Puoane T, Senekal M, Van der Merwe M. Obesity in South Africa: challenges for government and health professionals. Public Health Nutr. 2005;8(05):491-500.
22. Aikins AdG. Reframing applied disease stigma research: a multilevel analysis of diabetes stigma in Ghana. J Community Applied Social Psychol. 2006;16(6):426-41.
23. Amoah A. Obesity in adult residents of Accra, Ghana. Ethnicity Disease. 2003;13(2):97-101.
24. Bryman A. Social research methods. 2nd ed. Oxford: Oxford University Press, 2004.
25. Creswell JW. Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications; 2013.
26. Mugenda OM. Research methods: Quantitative and qualitative approaches. African Centre for Technology Studies; 1999.
27. Thomas JR, Helson JK, Silverman SJ. Research methods in physical Activity. (5th Ed) Champain In: Human Kinetics. 2005: 220-230.
28. Muhihi AJ, Njelekela MA, Mpembeni R, Mwiru RS, Mligiliche N, Mtabaji J. Obesity, overweight,

and perceptions about body weight among middle-aged adults in Dar es Salaam, Tanzania. ISRN Obesity. 2012;2012:368520.
29. WHO. Obesity: Preventing and managing the global epidemic, Report of WHO Consultation Technical Report Series No. 894. WHO; Geneva 2000.
30. Abachinga C. The Prevalence of Obesity in School Going Children in Achimota-Legon area. Legon: University of Ghana. 2001.
31. Amegah A, Lumor S, Vidogo F. Prevalence and determinants of overweight and obesity in adult residents of Cape Coast, Ghana: A hospital-based study. African J Food Agriculture Nutrition Development. 2011;11(3).
32. Mogre V, Mwinlenaa P, Oladele J, Amalba A. Impact of physical activity levels and diet on central obesity among civil servants in Tamale metropolis. J Med Biomed Sci. 2012;1(2):1-9.
33. Ntui E. Aerobic and prolonged intensive studies for students of secondary and tertiary institutions. Calabar: University of Calabar Press; 2000.
34. Murray CJ, Vos T, Lozano R, Naghavi M, Flaxman AD, Michaud C, et al. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. Lancet. 2013;380(9859):2197-223.
35. Wabitsch M. Molecular and biological factors with emphasis on adipose tissue development. Child and Adolescent Obesity. Causes and Consequences. 2002: 50-68.
36. Popkin BM. The nutrition transition and its health implications in lower-income countries. Public Health Nutr. 1998;1(01):5-21.
37. Prentice AM, Jebb SA. Fast foods, energy density and obesity: a possible mechanistic link. Obesity Rev. 2003;4(4):187-94.
38. Gibson RS. Principles of nutritional assessment. Oxford university press, USA; 2005.
39. Bertone ER, Staneck Es, Cohen NL. Association between eating patterns and obesity in a free living US adult population. Am J Epidemiol. 2003:158:185-92.
40. WHO. Physical activity and young people. Available at: http://www.who.int/dietphysical-activity/physical-activity-recommendations-5-17years.pdf? ua=1 2011c. Accessed on 15 October 2015.

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