AN EXPLORATORY STUDY OF PHYSICAL ACTIVITY AND OVER-WEIGHT IN TWO SENIOR HIGH SCHOOLS IN THE ACCRA METROPOLIS

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SUMMARY

Background: Overweight and physical inactivity are major risk factors for non-communicable diseases. However, little evidence on physical activity, and overweight exists to support intervention in specific sub-populations including adolescents in low-income settings like Ghana. This study aimed at estimating overweight and determining the pattern and level of physical activity among senior high school students in the Accra Metropolis.

Methods: A cross-sectional study was conducted in the Accra Metropolis, among senior high school students, ages 15 to 19 years. Participants were selected using a two-stage cluster sampling technique. Structured questionnaire and anthropometric measurement were employed to gather information for the study. Students were considered as overweight if their Body Mass Index (BMI) ≥ +1SD, and obese if BMI ≥ +2SD.

Results: Out of 444 students, 17% were classified as engaging in low level physical activity, 49% in moderate activity, and 34% in high level of physical activity. Much of the activity in boys was recreational while among girls, was due to domestic chores. The prevalence of overweight was 11.7%. Overweight prevalence was higher among female students (15.6%) compared to 4.5% in males. Furthermore the risk of overweight was lower among students who engaged in high physical activity than those engaged in low activity. Overweight was independently associated with physical activity (p=0.01), sex (p=0.001) and age (p=0.01), after controlling for age sex and physical activity and diet.

Conclusion: Majority of students in the study engaged in moderate to high physical activity. The prevalence of overweight was 11.7%. Physical activity was significantly related to overweight among students in the study.

Keywords: Overweight, Physical Activity, School, Adolescent, Diet, Ghana

INTRODUCTION

There is clear evidence that physically active persons have higher levels of health-related fitness, and a lower risk for developing various chronic diseases than those who are inactive.[1,3,4,5,6] The World Health Report of 2003[7]reported that at least 60% of the global population fails to achieve the minimum recommendation of 30 minutes moderate intensity physical activity daily.[7] Physical activity declines with age, falling off from adolescence, and is associated with overweight and other chronic diseases.[8]

According to Silveira et. al., 2006[9], the prevalence of obesity/overweight during childhood and adolescence is increasing rapidly in both the developed and the developing world and has already reached epidemic proportions.[9,10] The Global School Based Student Health Survey conducted in Ghana in 2008, reported that the prevalence of overweight among senior high school student was 6.6%.[8] Another study by Seneadza in 2008[10] in the Accra Metropolis also estimated overweight to be 8.6% among senior high school students.

Although the word health report and other studies reports that adolescent overweight is a global problem[7], no studies have assessed physical activity and its relationship to overweight among adolescents in Ghana. Studies among adults, suggest low levels of physical activity among overweight individuals in Ghana.[11,5,12]

However the relationship between physical activity and overweight among adolescents has not been documented in Ghana. This study aims at estimating overweight prevalence and also determining the pattern and level of physical activity among senior high school students in the Accra Metropolis.

METHODS

Study sites

The study was conducted in two senior high schools (Labone Senior High School and Social Advance Institute) in the Accra metropolis.

Sampling and data collection

Two stages cluster sampling procedure was use to select 480 respondents for the study. In the first stage, two schools were randomly selected from the 52 Senior High Schools in the Accra Metropolis through a simple random sampling. Six classes from each school were then randomly selected and all students in selected classes were included in the study. Two hundred and forty (240) students from each school were interviewed. A structured questionnaire including the International Physical Activity Questionnaire (IPAQ the short form)[14,15,16] was used for data collection. The IPAQ items collected recent physical activity history by recall over the past 7 days. Other data collected included the social demographic characteristics, dieting history over the past 7 days, and participating in sporting activities. Anthropometric measurements of students were also measured by the questionnaire.

Ethical issues

Ethical approval for the study was obtained from the Ghana Health Service Ethical Review Committee. Permission was also sought from the Headmistresses of the selected Senior High Schools prior to data collection. The School Administration and study subjects were also assured of the confidentiality, data safety and appropriate data usage. There were no known risks of using the data, and benefits of using the collected data were immense to provide evidence based information on physical activity and overweight. Furthermore, there was no conflict of interest.

Data analysis

Data was entered by EPI-INFO Version 3.4.1 and analyzed by STATA for Windows (Statcorp, College Station, USA).

Level and pattern of physical activity:

The Guidelines for Data Processing and Analysis of the International Physical Activity Questionnaire (IPAQ)[16] 2005 was used to determine the intensity of physical activity. The weekly minutes of walking, moderate intensity and vigorous-intensity activity were calculated separately by multiplying the number of days/week by the duration of activity on an average day. Reported minutes per week in each category were weighted by a metabolic equivalent (MET)[16] resulting in a physical activity estimate independent of body weight, expressed in MET-minutes/week and computed by multiplying METs by minutes/week. The total MET-minutes per week score was estimated by adding the MET-minutes per week score from each category of walking, moderate and vigorous.[14]. Higher intensity activities, such as skating, cycling, dance, martial arts activities, and active sports, were assigned 5 to 8 METs. Moderate physical activity was assigned 4.0 METs and Walking (low) physical activity 3.3 METs.[16,15,17] Using these values, four continuous scores were defined:

Table 1 Guidelines for estimation of Scores of Physical Activities

No.	Physical activity	Estimation
1	Walking MET-minutes/week	Calculated by multiplying 3.3 by walking minutes and the number of walking days.
2	Moderate MET-minutes/week	Calculated by multiplying 4.0 by moderate-intensity activity minutes and the number of moderate intensity days.
3	Vigorous MET-minutes/week	Calculated by multiplying 8.0 by vigorous-intensity activity minutes and number of vigorous-intensity days.
4	Total Physical activity	MET-minutes/week which is the sum total of Walking, Moderate, and Vigorous MET minutes/week scores.

The Total physical activity was further used to classified students into high moderate and low physical activity. A student's physical activity score was defined as high if the student had at least 7 days of any combination of walking, moderate or vigorous intensity activities accumulating at least 3000 MET-minutes/week; as moderate if the student had at least 5 days of any combination of walking, moderate-intensity or vigorous intensity activities achieving between 600 and 2999 MET-minutes/week and as low if the student did not meet the conditions for high and moderate.[16]

Overweight Among Students:

Overweight status was determined using the WHO growth reference standards for children and adolescents.[2] Students were considered as overweight if their BMI $\geq$ +1SD, and obese BMI $\geq$ +2SD.[2] The definitions of overweight and obesity were based on the WHO's global growth references released in 2007 for children

and adolescents; overweight is estimated as BMI ≥ +1Standard Deviations of the median of the reference is equivalent to or greater than 25kg/m^2; similarly, obesity is estimated as BMI≥+2 Standard Deviations of the median of the reference curve. Literature supporting this approach is referenced below. The WHO's AnthroPlus software was used to estimate the overweight status.[2]

Association between Physical Activity and Overweight:

A logistic regression model was used to estimate the relationship between overweight and physical activity status. Sex, age and diet were considered to be important potential confounders and were included in the model as factors. First, a model was produced for each covariate; in this model, each covariate was candidate for inclusion, provided that, when considered singly, the p- value for determining association with overweight was 0.05 or less. Variables were then removed if the p- value for the likelihood ratio test was more than 0.05 and provided that removal did not change the coefficients of variables in the model by more than 10%. Secondly, the variables in these models were combined in a final multivariate model

RESULTS

Characteristics of Respondents

Table 2 describes the characteristics of respondents. The response rate was 100% (480), however due to incomplete responses, 444 fully completed questionnaires were analyzed. Overall, thirty five percent 35% (155) of respondents were males and 65% (289) were females. Seventy six per cent (76%) were day students (attending school from home) and the remaining 24% were boarders (living in school accommodation on campus or in a hostel close to the school). Also, 52% of the students reported that their male parents had professional/technical occupation, 24% self employed, 10% traders, 6% engaged in unskilled labour, 2% clerical job and 5% unemployed.

Nineteen percent (19%) of students reported that their female parents were professionals/technical workers, 14% self employed, 61% traders, 1% engaged in unskilled labour and 3% unemployed.

Furthermore, 15% male and 27% female parents had middle/JHS education and 81%% male and 60% female parents also had secondary education or beyond. Ninety three percent (93%) of respondents reported that they do not drink alcohol while 7% reporting they take in alcoholic drinks. Thirty five percent (35%) of respondent take in energy drinks, whereas 65% do not. None of the students interviewed reported smoking or using any drug.

Table 2 Characteristics of senior high school students (N=444)

Characteristics	% (444)
Dietary habit	
Not adequate*	53.8 (239)
Adequate	46.2 (205)
Sex	
Female	65.0 (289)
Male	34.9 (155)
Age (Years)	
15	12.6 (56)
16	22.5 (100)
17	39.9(133)
18	21.6 (96)
19	13.3 (59)
Mother's education	
None	6 .1(27)
Primary	6.4 (28)
Middle/JHS	27 .2(120)
Secondary+	60.3 (266)
Residential Status	
Day	75.9 (337)
Boarding/Hostel	24.0 (107)
Religion	
Christianity	81.9 (364)
Moslem	8.8 (39)
Others	9 .2(41)
Ethnicity	
Akan	49.6 (176)
Ewe	18.5 (82)
Ga/Dangme	27.9 (124)
Others	13.9(62)
Physical activity score	
Low	16.6 (74)
Moderate	49.3 (219)
High	34.0 (151)

High = At least 7 days of any combination of walking, moderate- or vigorous-intensity activities accumulating at least 3000 MET-minutes/week; Moderate= At least 5 days of any combination of walking, moderate-intensity or vigorous intensity activities achieving between 600 to 2999 MET-minutes/week; Low= not meeting conditions for high and moderate *Students who eat both fresh fruit and vegetables at least twice per day.

Physical Activity among Students

Eleven percent (11%) males and 19% female students engaged in low level activity 43% males and 53% females engaged in moderate level of activity and 45% of males and 27% female students engaged in high level.

Table 3 Overweight prevalence and distribution among high school students in Accra, Ghana (N=444)

Characteristics	Number students	Proportion Overweight
Dietary habit*		
Not adequate	239	11.3
Adequate	205	12.2
Sex		
Female	289	15.6
Male	155	4.5
Age (Years)		
15	56	14.3
16	100	20
17	133	11.3
18	96	8.3
19	59	1.7
Mother's education		
None	27	7.4
Primary	28	10.7
Middle/JHS	120	8.3
Secondary+	266	3.5
Residential Status		
Day	337	12.5
Boarding/Hostel	107	9.4
Religion		
Christianity	364	11.5
Moslem	39	12. 9
Others	41	12.2
Ethnicity		
Akan	176	13.1
Ewe	82	12.2
Ga/Dangme	124	10.5
Others	62	9.7
Physical activity score		
Low	74	20.3
Moderate	219	12.8
High	151	6
Total	**444**	**11.7**

*Students who eat both fresh fruit and vegetables at least twice per day=adequate, less than the above is inadequate.

Overweight among Students

The prevalence of overweight was 11.7% (52/444) among the study population (Table 3). Overweight was higher among female (15.6%) than males (4.5%). Prevalence of overweight was low among student engaged in high level of physical activity than low level physical activity (Table 3).

Overweight prevalence was also high (20%) among the 16years age group and low (1.7%) among the 19years age group in the study. The prevalence of obesity among the study population was 2.9%

Relationship between Physical Activity and Overweight

The result indicated that the sex of a student in this study was highly significant with the odds of overweight (p-value <0.001). The age of a student was also significantly associated with the odds of overweight (p-value <0.01). Physical activity was also significantly associated with the odds of overweight (p-value 0<0.01). Dietary behaviour was not significantly associated with the odds overweight in this study (Table 4).

After adjusting for the effect of sex, age and fruit and vegetable intake, high physical activity was significantly associated with overweight. (Adjusted OR=0.37; 95% CI: 0.15, 0.95) (Table 5).

Table 5 Adjusted odds ratios describing association between physical activity and overweight among Senior High School Students in Accra Metropolis

	Adjusted OR (95%CI) †	P-value §
Physical activity score		P=0.01
Low	1	
Moderate	0.61 (0.29, 1.26)	
High	0.37 (0.15, 0.95)	
Sex		P<0.01
Female	1	
Male	0.28 (0.12, 0.66)	
Diet		P=0.59
Not Adequate	1	
Adequate	1.19(0.64, 2.20)	
Age (Years)		P=0.01
15	1	
16	1.57(0.63, 3.95)	
17	0.78(0.30,2.02)	
18	0.63(0.21,1.83)	
19	0.11(0.01,0.94)	
† OR indicates the ratio of overweight prevalence compared with reference category		
§ Likelihood ratio test		

Table 4 Bivariate logistic regression identifying risk factors for overweight among senior high school students

Characteristics	(%) No of students	OR (95%CI) †	p-value
Sex			P<0.001
Female	65.0 (289)	1	
Male	54.9(155)	0.26 (0.11, 0.58)	
Age (Years)			P<0.01
15	12.6 (56)	1	
16	22.5 (100)	1.5 (0.61, 3.67)	
17	29.9 (133)	0.76 (0.30, 1.92)	
18	21.6 (96)	0.55 (0.19, 1.55)	
19	13.3 (59)	0.10 (0.01, 0.86)	
Mother's education			P=0.42
None	6.1 (27)	1	
Primary	6 .4(28)	1.5(0.23,9.76)	
Middle/JHS	27.2 (120)	1.14(0.23,5.51)	
Secondary+	60.3 (266)	1.96(0.44,8.62)	
Residential Status			P=0.37
Day	75.9 (337)	1	
Boarding/Hostel	24.0 (107)	0.72 (0.35, 1.50)	
Religion			P=0.97
Christianity	81.9 (364)	1	
Moslem	8.8 (39)	1.13(0.42,3.04)	
Others	9.2 (41)	1.06(0.40,2.86)	
Ethnicity			P=0.86
Akan	39.6 (176)	1	
Ewe	18.5 (82)	0.92 (0.41, 2.04)	
Ga/Dangme	27.9 (124)	0.78 (0.38, 1.60)	
Others	13.9 (62)	0.71 (0.28, 1.84)	
Eat high fruit and Vegetables ¥			P=0.77
No	53.8(239)	1	
Yes	46.1 (205)	1.09 (0.61, 1.95)	
Physical activity score ¶			P=0.01
Low	17.6 (74)	1	
Moderate	49. 3 (219)	0.58 (0.29, 1.15)	
High	34.0 (151)	0.25 (0.10, 0.60)	

¥ Students who eat both fresh fruit and vegetables at least twice per day

¶ High = At least 7 days of any combination of walking, moderate- or vigorous-intensity activities accumulating at least 3000 MET-minutes/week;

Moderate= At least 5 days of any combination of walking, moderate-intensity or vigorous intensity activities achieving a minimum of at least 600 MET-minutes/week;

Low= not meeting conditions for high and moderate.

DISCUSSION

This study examined the relationship between physical activity and overweight among senior high school students in the Accra Metropolis. The intent of the study was to provide information on the intensity and frequency of physical activities and the levels of activities among students. The study also estimated the prevalence of overweight among senior high students in Accra Metropolis. More females (19%), than males (11%) were involved in low-level activity in the study.

The finding is similar to the 2008 Global School - Based Students Health Survey in Ghana, which reported that more female engaged in low level of activity than males.[8]

Results from the study also showed that 49% engaged in moderate physical activity with more females (52.9%) involved in moderate activities than males (42.6%). Furthermore male students (45.8%) engaged in high-level activity than female students (27.7%). The Global School–Based Student Health Survey also reported that male students are more likely to engage in high activity than female students.[8]

A survey in South Africa also reported that male students are more active than female students.[18]

The prevalence of overweight (11.7%) in this study compared to other studies showed that overweight prevalence keeps going up in subsequent studies. Overweight prevalence among students in Accra Metropolis in the 2008 was 8.6%. Overweight rates were high among respondents with low level of physical activity (20.3%) than those who engage in moderate (12.8%) and high (6%) activity. This may be due to the fact that they do little or no activity or because they are overweight they are not able to do physical activities. The study further indicated that females (15.6%) are more likely to be overweight than male (4.5%) students.

The results on overweight is similar with what other studies in Ghana and elsewhere which reported that overweight prevalence is high among females than males[19,5] Females are at a higher risk of being overweight. This can be attributed to the higher level of physical activity among males than female adolescents. There was evidence of a significant association between physical activity (p-value 0<0.01), sex (p-value <0.001), and age (p-value <0.01) with odds of overweight.

After adjusting for the confounding effect of sex, age and diet behavior, the odds of overweight can be reduced by 63% among students with high physical activity compared with those having low physical activity (Adjusted OR=0.37; 95% CI: 0.15, 0.95; p=0.01).

CONCLUSION

Majority of students in the study especially females engaged in moderate physical activity. More male students engaged in high level physical activity than the females. The prevalence of overweigh was 11.7%. Physical activity was significantly related to overweight among students in the study. The study recommends that students should be encouraged to engage in recreational physical activities. Students must also be educated on the need for physical activities. The study also urge for further studies on adolescent physical activity and overweight.

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