Prevalence of Elevated and Hypertension among Secondary School Students in Ghana

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Abstract:
Introduction: Worldwide prevalence of hypertension in 2014 was 22% and is expected to increase.Prevalence of hypertension has been on the increase among adolescentsworldwide that persist during adulthood and has become a major public health problem. However, few studies on hypertension has been studied among secondary school students in Ghana. Materials and Methods: A cross sectional study design was conducted among 14-19-year-old secondary school students in two districts of Ghana. A validated self-administered questionnaire was used to collect data on socio-demographic characteristics, blood pressure, physical activity, weight and height. Two blood pressure measurements were taken for each student with Omron HBP-1100 automated BP (blood pressure) monitor while weight and height were taken with Tanita Model HD 309 and Seca body Meter Model 208 respectively. Data was analyzed with SPSS version 22 with descriptive statistics such as means, frequencies and percentages. Chi-Square test and Logistic regression were also utilized. Results: Prevalence of hypertension and elevated was 24.4%. There were 11.0% students who were overweight while2.2% were obese. Approximately 34.6% of the students were physically inactive. The independent variables in the logistics regression for hypertension was body mass index and physical activity. Conclusion:Risk factors of hypertension are increasing among students. A behavioral modification intervention should be implemented in secondary schools to reduce risk factors of hypertension among the students.

Keywords: Hypertension, elevated, BMI, physical activity, prevalence, secondary schoolstudents

1. Introduction

Hypertension is a major risk factor of cardiovascular disease (CVD) (Chiolero et al., 2013; Kuciene & Dulskiene, 2014) and one of the most important contributors of morbidity and mortality in the world (Fortuna et al., 2015). The worldwide prevalence of hypertension in 2014 was around 22% and it expected to grow to more than 500 million by 2025 (Boateng et al., 2015). Africa recorded the highest prevalence of hypertension (30%) across the WHO regions while the lowest prevalence was in the Americas (18%). There were 9.4 million deaths globally due to hypertension in 2010 (WHO, 2014). People with hypertension develop CVDs earlier than people with normal blood pressure (Rapsomaniki et al., 2014). Hypertension has been on the increase in Ghana. The number of reported new cases of hypertension between 1988 and 2007 rose by more than 1000% (Ofori-Asenso & Garcia, 2015). Prevalence of adult hypertension in Ghana is at 48% and has ranked continuously among the top ten causes of outpatient morbidity, admission and death (Ghana Health Service, 2017). There were 964,724 newly reported cases of adult hypertension in outpatient departments across hospitals in Ghana in 2014 alone (Ghana Health Service, 2015).

Studies have shown that prevalence of hypertension has been on the increase among children which persist into adulthood(Chen & Wang, 2008; Spagnolo et al., 2013). For instance, a study in America by Thompson et al. (2013) among children and adolescents indicated that between 1% and 5% were hypertensive. Other studies in United Arab Emirates (Abdulle et al., 2014) and Turkey (Demirci et al., 2013) have reported 16.6% and 8.5% hypertension respectively among

children. A study in Ghana reported prevalence of 32.3% and 4% elevated and hypertensive respectively among the youth(Afrifa-Anane et al., 2015).The study further reported that physical activity among respondents was low and was associated with hypertension and BMI. However, very few studies on hypertension has been conducted among secondary school students in Ghana. Studies in this area are crucial to enable policy makers, researchers and the Ghanaian Ministry of Health to develop appropriate interventions to curb this situation. This study therefore aims to conduct a cross sectional survey on prevalence of elevated and hypertension among secondary school students in Ghana.

2. Materials and Methods

2.1. Study Design
This study was a cross sectional design carried out in Ghana from January to March, 2018.University Putra Malaysia (UPM/TNCP/1.4.18.2 (JKEUPM) and the Kintampo Health Research Centre (KHRCIEC/2017-16)gave ethical clearance for this study. Permissions were obtained from the Ministry of Education, headmasters and parent teacher association chairmen of selected schools. Consents forms were given to all participating students and their parents/guardians before the study began. Code numbers were given to students and they were asked not to write their names or signatures on the questionnaires to ensure confidentiality.

2.2. Sampling
Students were recruited from four public secondary schools in two selected districts (Kintampo-North and Nkoranza-North) of the Brong Ahafo region by systematic random sampling. There were two public secondary schools in each of the two districts and all the schools were included in this study. Students were randomly selected from the lists of students from form one to three, given by headmasters, by random number generation by an independent biostatistician who was not involved in the study. The study would require a 90% power to defect an effect of 0.8 standard deviation at the 5% significance level taking into consideration a 10% non-response rate.The sample size was 848. Weight and height measurements were taken by trained health staff and measuring instruments were standardized on daily basis.

2.3. Study Variables
The analysed variables included age (years), gender, ethnicity, parent's education, elevated, hypertension, weight (kg), height (cm), BMI (kg/m^2), and physical activity.

2.4. Dependent Variable

2.4.1. Hypertension
Two blood pressure readings were taken with an Omron HBP-1100 automated BP monitor. The measurements were taken by trained health staff with the respondent comfortably seated for five minutes while legs were not crossed and the back and the arm supported before readings were taken. The respondent wasallowed to rest a minute after the first reading before the second measurement was taken(Pickering et al., 2005). The average of the two was used to classify students. Normal systolic or diastolic blood pressure is defined as <90thpercentile for age and gender. Elevated is when systolic or diastolic blood pressure is between 90th and 95thpercentile. Hypertension is when systolic or diastolic blood pressure exceeds 95th percentile(*Fourth Report on Diagnosis , Evaluation , and Treatment of High Blood Pressure in Children and Adolescents*, 2005).

2.5 Independent Variables

2.5.1 Body Mass Index
Weight and height measurements were the anthropometry measurements that were taken. Weight was taken with Tanita Model HD 309to the nearest 0.1kg. Students were asked to remove shoes and any item in the pocket. They were then asked to stand upright on the scale and the measurement was taken. Height was measured using a Seca Body Meter Model 208 to the nearest 0.1cm. Each respondent was asked to stand and looked straight, without shoe with heels resting together. Height measurement which appeared in the read-off area was recorded. Height and weight measurements were used to assess students BMI(BMI=Weight in kg/Height in m^2) in terms of underweight, normal, overweight, and obesity. Underweight was when BMI for age was less than 5thpercentile, 5th to < 85thfor normal weight, 85th to < 95th for overweight and ≥95threpresented obesity(Barlow, 2007; WHO, 2007).

2.5.2 Physical Activity
The physical activity questionnaire (PAQ-A) for secondary school adolescents(Kowalski et al., 2004) was used to measure physical activity levels. It was a seven-day recall instrument to assess general levels of physical activity among respondents. Each physical activity item was scored on a five-point scale. The value from one to five for each of the items used in the physical activity composite score, then the mean of the items which resulted in the final PAQ-A activity summary score.

2.6. Statistical Analysis
Descriptive data was analyzed using SPSS version 22. The level of significance for all the statistical tests was set at 0.05. Frequencies and percentages were used to summarize data. For mean estimations, 95% confidence intervals (CI) was

computed.Chi-Square test was used for categorical variables. Logistic regression was used to analyze contribution of independent variables on elevated and hypertension.

3. Results

3.1. Socio-Demographic Characteristics of Students

The study included 848 public secondary school students between the ages of 14 to 19 years old. Majority of the students (30.8%) were between the ages of 17 years old while females made up 51.5% of the study sample. A total of 53.2% were of Akan ethnic background. Most students reported that their fathers (48.0%) and mothers (51.5%) had no formal education while 6.3%and 3.8% fathers and mothers respectively had tertiary education in Table 1.

Socio-Demographic Factors	Frequency	(%)
Age (years)		
Mean (SD)	16.99	(1.4)
Range		(14-19)
Gender		
Male	411	(48.5)
female	437	(51.5)
Ethnicity		
Akan	451	(53.2)
Dagarte	171	(20.9)
Konkomba	108	(12.7)
Mo	83	(9.8)
Others	29	(3.4)
Father's education		
No formal education	407	(48.0)
Primary school	73	(8.6)
Junior high school	170	(20.0)
Secondary school	145	(17.1)
Tertiary	53	(6.3)
Mother's education		
No formal education	437	(51.5)
Primary school	115	(13.6)
Junior high school	164	(19.3)
Secondary school	100	(11.8)
Tertiary	32	(3.8)

Table 1: Socio-Demographic Characteristics of Respondents

3.2. Hypertension, BMI, and Physical Activity

In Table 2, Prevalence of elevated and hypertension was 24.4%. A total of 2.2% students were obese while 11.0% were overweight. On the other hand, 34.6% of the students were physically inactive with only 13.6% who were physically active (high).

Variable	Frequency	(%)
Blood pressure		
Normal blood pressure	641	(75.6)
Elevated & hypertension	207	(24.4)
BMI		
Underweight	22	(2.6)
Normal	714	(84.2)
Overweight	93	(11.0)
Obese	19	(2.2)
Physical activity		
Low	293	(34.6)
Medium	440	(51.9)
High	115	(13.6)

Table 2: Blood Pressure, BMI, and Physical Activity of Respondents

3.3. Blood Pressure Distribution among BMI and Physical Activity

In Table 3, 0.7% and 3.2% obese and overweight students respectively were either elevated or hypertensive. On physical activity, 8.4% (low) and 12.5% (medium) students were either elevated or hypertensive.

Variable	Normal Blood Pressure		Elevated and Hypertension		χ^2	df	p
	Frequency	(%)	Frequency	(%)			
BMI					3.072	3	0.381
Underweight	19	(2.2)	3	(0.4)			
Normal weight	543	(64.0)	171	(20.2)			
Overweight	66	(7.8)	27	(3.2)			
Obese	13	(1.5)	6	(0.7)			
Physical activity					0.205	2	0.903
Low	222	(26.2)	71	(8.4)			
Medium	334	(39.4)	106	(12.5)			
High	85	(10.0)	30	(3.5)			

Table 3: Blood Pressure versus BMI and Physical Activity

3.4. Independent Contribution of Age, BMI, and Physical Activity on Hypertension among Students

The results from logistic regression in Table 4 shows that BMI (6.717, *p* = 0.010) and physical activity (5.013, *p* = 0.033) contributed significantly to elevated and hypertension, while age (1.956, *p* = 0.162) was not.

Independent Variables	B Coefficient	Standard Error	Wald	df	Exp (B)	95% CI (Exp B)	p
Age	0.081	0.058	1.956	1	1.085	(0.968 – 1.215)	0.162
BMI	0.077	0.030	6.717	1	1.080	(1.019 – 1.145)	0.010
Physical activity	0.056	0.071	5.013	1	1.137	(1.037 – 1.186)	0.033

Table 4: Independent Distribution of Age, Weight, and BMI on Blood Pressure in Students

4. Discussion

This study was conducted to find prevalence of elevated and hypertension among public secondary school students. Information on prevalence of hypertension among secondary school students seem to be scanty in Ghana. Hypertension and elevated among students were 24.4%. This was similar with studies among undergraduate students in Ghana (Gyamfi et al., 2018) but lower than a study in same country among the youth (Afrifa-Anane et al., 2015). Risk for CVD doubles with each increase of 20/10 mmHg (WHO, 2011) and therefore we recommend for screening of students on blood pressure and to monitor their BMI and physical activity. The other aspect of it is that many Ghanaians are unaware they have the condition. The Ministry of Health (Ministry of Health, 2012) has reported that up to about 70% of Ghanaians who were detected to have hypertension were not aware of it. Out of this number, up to 13% only have their blood pressure controlled. Further, because the disease starts during childhood, measures should be put in place for prevention and or early detection.

The prevalence of obesity and overweight were 2.2% and 11% respectively. This was consistent with studies among secondary school students in Ghana (Kumah et al., 2015; Nyawornota et al., 2013). Obesity and overweight are major risk factor of hypertension, diabetes, and CVDs (Brady, 2016; Schutter et al., 2014). Results from logistic regression indicated that BMI contributes significantly to blood pressure. This suggest that children who are obese are at a higher risk of developing diseases and mortality in adulthood, poor mental, and physical health (Black et al., 2015; Robertson et al., 2016). There is evidence to suggest that lifestyle interventions on modifiable risk factors may prevent the onset of diabetes and future risk of obesity (Obirikorang et al., 2016).

This study showed that 34.6% of students were physically inactive. This is consistent with studies in Ghana by (Mogre et al., 2013). Physical inactivity is a major cause of overweight, obesity, and hypertension (WHO, 2010). The health benefits of physical activity includes prevention of obesity and hypertension (Hills et al., 2015). Physical activity declines during childhood and this declines faster during the adolescents' age (Dumith et al., 2011; Nader et al., 2008) and therefore is it critical to educate and motivate students to do some form of moderate to high physical activity on daily basis. Results also showed that low physical activity is a contributing factor of hypertension. A study by Afrifa-Anane et al. (2015) reported similar trends in his study among the youth. A meta-analysis of prospective studies has indicated doing some form of moderate to high physical activity reduces the risk of coronary heart disease and stroke by 20-30% and 10%-20% in men and women respectively (Li & Siegrist, 2012).

5. Conclusion

It is clear from the findings of this study that risk factors of hypertension are increasing among students. Body mass index and physical activities were major contributors towards hypertension. It is highly recommended that students should be screened in the schools for early detection of hypertension and its risk factors. Finally, it is recommended for behavioral modification intervention in schools to reduce risk factors of hypertension among secondary school students.

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