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The Relationship Between Lifestyle Variables, Blood Pressure and Dietary Habits of Male Adult Miners in Ghana

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ABSTRACT

Hypertension is a major public health problem in both the developed and the developing world and it is mostly associated among individuals, who indulge in unhealthy lifestyles and certain dietary habits. The study was a cross-sectional, involving 320 male miners in the Obuasi municipality. The study was conducted to generate data on the relationship between lifestyle variables, blood pressure and dietary habits of male adult miners. Cluster and simple random sampling techniques were used to select the respondents from their residential areas. Chi-square test was used to test for significance between lifestyle variables (alcohol intake, smoking and physical activity), blood pressure and dietary habits in male adult miners. The results indicated that about 41.6% of the respondents were hypertensive while the prevalence of smoking, alcohol intake and less than 8 h of sleep a day were 42.5, 66.9 and 59.7%, respectively. Less than half of the respondents (32.8 and 12.8%) participated in brisk walking and aerobic exercise, respectively. Physical activity level, alcohol intake and smoking did not indicate statistical association with blood pressure ($p > 0.05$).

Key words: Lifestyle variables, dietary habit, hypertension, miners, public health

INTRODUCTION

Lifestyle habits, such as unhealthy dietary habits, cigarette smoking and physical inactivity have been shown in studies to be among the risk factors that are linked to cardiovascular disease that in part may be mediated or modulated through effects on blood pressure and body weight (Couch and Daniels, 2005). These lifestyle factors may also be established during childhood and adolescence, however, their associations with weight status and blood pressure in childhood and adolescence are less clear than in adulthood (Serdula *et al.*, 1993). Studies have shown that nutrition education and information is an important factor to ensure healthy lifestyle which can also be a solution to the prevention of unhealthy eating and lifestyle behaviours (Roszanadia and Norazmir, 2011).

Dietary habits have been reported to be associated with increased blood pressure in adults (Appel *et al.*, 1997). Whereas in children and adolescents, this was not supported in two reviews of the available evidence (Simons-Morton and Obarzanek, 1997; Couch and Daniels, 2005). Besides, studies have also shown that cardiovascular diseases accounted for 14.5% of all deaths in Pechere-Bertschi *et al.* (2005). It is well known that cardiovascular diseases develop from cardiovascular risk factors such as obesity, hyperglycemia, hypertension and hyperlipidemia

(Pechere-Bertschi *et al.*, 2005). These risk factors are also called lifestyle-related diseases or metabolic syndrome and their correlation with various lifestyles has been reported by several studies (Nakanishi *et al.*, 2005).

High carbohydrate diet has been shown to increase plasma insulin to an extent which can be associated with increased risk of obesity, cardiovascular disease, diabetes and hypertension (Appel *et al.*, 1997; Rahman *et al.*, 2011). According to Hidayah and Bariah (2011) studies, it was evident that significant relation existed between dieting behavior and Body Mass Index (BMI).

Irregularity of meals, such as breakfast skipping, is associated with overweight and obesity in childhood and adolescence (Rampersaud *et al.*, 2005). However, the cause of this association remains unclear (Rodriguez and Moreno, 2006).

Physical inactivity is in itself an independent risk factor for cardiovascular disease in adulthood (Sesso *et al.*, 2000; Manson *et al.*, 1999). In addition, high physical activity is associated with reduced blood pressure and lower body weight (Fagard, 2001). The associations between physical activity and blood pressure are not established in adolescence (Kelley *et al.*, 2003; Alpert and Wilmore, 1994). However, sedentary lifestyle, environmental and genetic factors have also been implicated in diet related-non communicable diseases (Sivabalan and Menon, 2008; Ladan *et al.*, 2007).

Chronic consumption of alcohol intake causes fatty acid accumulation in the hepatocytes and decreases its function. Also alcohol consumption has been reported to be associated with cardiovascular morbidity and mortality. Individuals who consume more than one soft drink per day have a higher prevalence of metabolic syndrome than those who consume one soft drink per day (Jeroh *et al.*, 2012; Ebuehi and Asonye, 2007).

The effect of cigarette smoking on weight status and blood pressure is less well studied in adolescence than in adulthood, where smoking is found to be associated with increased arterial stiffness and dyslipidemia (Mahmud and Feely, 2003; Masulli *et al.*, 2006).

MATERIALS AND METHODS

A cross-sectional study design was employed in this study in male mine workers in the Obuasi municipality of Ghana. Employees aged 20-59 years who were healthy and were not on both antihypertensive and anti diabetic drugs, were recruited for this study. In this epidemiological study, subjects' identities were anonymous and unlinked to the data, as described in the Ethical Guidelines for Epidemiological (Ministry of Education, Culture, Sports, Science and Technology, Ministry of Health, Labour and Welfare, Japan, 2002). Besides, the study subjects were made to read and signed informed consent form. The study was approved by the University Ghana food and Nutrition Department Obuasi Municipal Health Directorate and the Obuasi Municipal Assembly. Using a 95% confidence interval, a prevalence of hypertension (28.7%) in the Ashanti Region of Ghana (Cappuccio *et al.*, 2004; Bahram *et al.*, 2001) percent error (d) of 5% a total of 320 subjects were recruited for the study. The sample size calculation was done using (Bahram *et al.*, 2001):

$$n = Z^2_{1-\alpha/2} P (1-P)/d^2$$

where, n is the sample size, Z is the 95% Confidence Interval (CI), P is the prevalence of hypertension in the Ashanti Region and d is the percent error.

The selection of the subjects for the study was done using cluster method. The clusters were divided into senior and junior staff Residential Areas (RA's), respectively. With the help of simple random sampling procedure 16 RA's out of 24 RA's in the Obuasi municipality identified by

AngloGold Ashanti estate Department as the official RA's of miners were randomly selected (Afoakwah and Owusu, 2011). Systolic and Diastolic Blood Pressure (SBP/DBP), height and body weight were measured using digital sphygmomanometer and scales, respectively. Body Mass Index (BMI) was calculated as body weight (kg) divided by the square of height (m²). All subjects were asked to fill out a questionnaire including medication conditions and lifestyle variables such as smoking, alcohol intake and physical activity level. Food frequency technique and 24 h dietary recall were also employed. Chi-square test was used to test for significance between lifestyle variables (alcohol intake, smoking and physical activity), blood pressure and dietary habits in male adult miners.

RESULTS

Blood pressure profile of workers: A total of 320 respondents were involved in this study. As shown in Table 1 below, 19.4 and 22.2% hypertensive cases were recorded for junior and senior staff, respectively while a total of 33.4 and 25.0% of them had normal blood pressure, respectively.

Lifestyle and blood pressure profile of miners: From Table 2 about 136 (42.5%) of the respondents smoked cigarette and 214 (66.9%) drank alcohol. Out of those who drank alcohol, the majority (98, 45.8%) drank stout alcoholic beverage. The level of physical activities (Table 3) showed that the majority (231, 72.2%) of the respondents stood for <5 h while 200 (62.5%) at for <7 h and 191 (59.7%) slept for <8 h. Respondents who sat for <7 h had a greater proportion (84, 26.3%) of hypertensive cases. About 105 (2.8%) of the respondents participated in brisk walking while 41 (12.8%) of them undertook aerobic exercise. Physical activity level, alcohol intake and smoking did not indicate statistical association with blood pressure (p>0.05).

DISCUSSION

Prevalence of blood pressure: In this study, the prevalence of 41.6% high blood pressure was found. This is higher than 27% hypertension prevalence recorded among adult Ghanaians aged 25 years and above. Amoah (2003) and that of Cappuccio *et al.* (2004) hypertension study in the Ashanti region where a prevalence of 28.7% was found. However, the prevalence of high blood pressure revealed in this research confirms the report of Boffetta *et al.* (2001), four mining companies, where high prevalence of hypertension, cerebrovascular and ischemic heart diseases were reported. Besides, the high prevalence of high blood pressure found in this study, can be associated to the night working duties miners undertake routinely as part of their working responsibilities and the poor ventilation underground. It has also been established in a research

Table 1: Blood pressure profile in relations hip to categories of workers (n = 320)

Categories of workers	Normotensive n (%)	Pre hypertensive n (%)	Hypertensive stage 1 n (%)	Hypertensive stage 2 n (%)	Total n (%)	p-value
Junior staff	9 (9.8)	98 (30.6)	37 (11.6)	25 (7.8)	178 (55.6)	0.59
Senior staff	11 (3.4)	69 (21.6)	44 (13.8)	27 (8.4)	142 (44.4)	
Total	20 (6.3)	167 (52.2)	81 (25.3)	52 (16.3)	320 (100.0)	
Categories: (mmHg)			Systolic			Diastolic
Normal			<120			<80
Pre-hypertension			120-139			80-89
Hypertensive, stage 1			140-159			90-99
Hypertension, stage 2			≥160			≥100

Source: Chronic Disease Service (2005)

Table 2: Lifestyle patterns of respondents in relation to blood pressure (n = 320)

Variables	Normotensive n (%)	Pre hypertensive n (%)	Hypertensive stage 1 n (%)	Hypertensive stage 2 n (%)	Total n (%)	p-value
Smoking status						
Yes	5 (1.6)	66 (20.6)	43 (13.4)	22 (6.9)	136 (42.5)	0.078
No	15 (4.7)	101 (31.6)	38 (11.9)	30 (9.4)	184 (57.5)	
Total	20 (6.3)	167 (52.2)	81 (25.3)	52 (16.3)	320 (100.0)	
No. of sticks smoked in a day						
1-3	3 (2.2)	44 (32.4)	25 (18.4)	14 (10.3)	86 (63.2)	0.993
4-6	2 (1.5)	16 (11.8)	14 (10.3)	7 (5.1)	36 (28.7)	
7-9	0 (0.0)	3 (2.2)	2 (1.5)	1 (0.7)	6 (4.4)	
10+	0 (0.0)	2 (1.5)	2 (1.5)	1 (0.7)	5 (3.7)	
Total	5 (3.7)	65 (47.8)	43 (31.5)	23 (16.9)	136 (100.0)	
Drinking status						
Yes	11 (3.4)	107 (33.4)	60 (18.8)	36 (11.3)	214 (66.9)	0.273
No	9 (2.8)	60 (18.8)	21 (6.6)	16 (5.0)	106 (33.1)	
Total	20 (6.3)	167 (52.2)	81 (25.3)	52 (16.3)	320 (100.0)	
Types of alcohol consumed						
Liquor	1 (0.5)	24 (11.2)	12 (5.6)	10 (4.7)	47 (22.0)	0.119
Lager Beer ¹	1 (0.5)	25 (11.7)	12 (5.6)	2 (0.9)	40 (18.7)	
Stout ²	7 (3.3)	49 (22.9)	28 (13.1)	14 (6.5)	98 (45.8)	
Wine	2 (0.9)	9 (4.2)	8 (3.7)	10 (4.7)	29 (13.6)	
Total	11 (5.1)	107 (50.0)	60 (28.0)	36 (16.8)	214 (100.0)	
Frequent use of alcohol						
Occasional drinkers	7 (3.3)	47 (22.0)	25 (11.7)	15 (7.0)	94 (43.9)	0.385
Every day drinkers	2 (0.9)	34 (15.9)	27 (12.6)	14 (6.5)	77 (36.0)	
Once a week drinkers	2 (0.9)	26 (12.1)	8 (3.7)	7 (3.3)	43 (20.1)	
Total	11 (5.1)	107 (50.0)	60 (28.0)	36 (16.8)	214 (100.0)	
Categories: (mmHg)		Systolic			Diastolic	
Normal		<120			<80	
Pre-hypertension		120-139			0-89	
Hypertensive, stage 1		140-159			90-99	
Hypertension, stage 2		≥160			≥100	

p-value significant at <0.05 (Chi-square test), ¹ Club Beer, Guilder, Star Beer, ²Guinness, Castle Milk Stout, Source: Chronic Disease Service (2005)

Table 3: Association between physical activity level and blood pressure (n = 320)

Variables	Normotensive n (%)	Pre hypertensive n (%)	Hypertensive stage 1 n (%)	Hypertensive stage 2 n (%)	Total n (%)	p-value
Physical activity						
Standing						
<5 h	12 (3.8)	121 (37.8)	59 (18.4)	39 (12.2)	231 (72.2)	0.775
5-8 h	4 (1.3)	32 (10.0)	15 (4.7)	9 (2.8)	60 (18.8)	
>8 h	4 (1.3)	14 (4.4)	7 (2.2)	4 (1.3)	29 (9.1)	
Total	20 (6.3)	167 (52.2)	81 (25.3)	52 (16.3)	320 (100.0)	
Physical activity						
Sitting						
<7 h	8 (2.5)	108 (33.8)	55 (17.2)	29 (9.1)	200 (62.5)	0.190
7-10 h	8 (2.5)	47 (14.7)	21 (6.6)	19 (5.9)	95 (29.7)	
>8 h	4 (1.3)	12 (3.8)	5 (1.6)	4 (1.3)	25 (7.8)	
Total	20 (6.3)	167 (52.2)	81 (25.3)	52 (16.3)	320 (100.0)	

Table 3: Continued

Variables	Normotensive n (%)	Pre hypertensive n (%)	Hypertensive stage 1 n (%)	Hypertensive stage 2 n (%)	Total n (%)	p-value
Physical activity						
Sleeping						
<8 h	15 (4.7)	96 (30.0)	51 (15.9)	29 (9.1)	191 (59.7)	0.659
8-10 h	3 (0.9)	49 (15.3)	20 (6.3)	18 (5.6)	90 (28.1)	
>10 h	2 (0.6)	22 (6.9)	10 (3.1)	5 (1.6)	39 (12.2)	
Total	20 (6.3)	167 (52.2)	81 (25.3)	52 (16.3)	320 (100.0)	
Brisk walking						
Yes	8 (2.5)	57 (17.8)	24 (7.5)	16 (5.0)	105 (32.8)	0.784
No	12 (3.8)	110 (34.4)	57 (17.8)	38 (11.3)	279 (87.2)	
Total	20 (6.3)	167 (52.2)	81 (25.3)	52 (16.3)	320 (100.0)	
Aerobics						
Yes	1 (0.3)	26 (8.1)	7 (2.2)	7 (2.2)	41 (12.8)	0.320
No	19 (5.9)	141(44.1)	74 (23.1)	45 (14.1)	279 (87.2)	
Total	20 (6.3)	167(52.2)	81 (25.3)	52 (16.3)	320 (100.0)	
Categories: (mm Hg)	Systolic				Diastolic	
Normal	<120				<80	
Pre-hypertension	120-139				80-89	
Hypertensive, stage 1	140-159				90-99	
Hypertension, stage 2	≥ 160				≥100	

p-value significant at <0.05 (Chi-square test), Source: Chronic Disease Service (2005)

that workers on night duties result to the intake of cigarettes, caffeine and other stimulants to prevent sleeping, which is known to be associated with cardiovascular disease (Health Study Release, 2003) and above all, epidemiological study had showed an association between shift work and cardiovascular disease with workers on night duties having high blood pressure (Health Study Release, 2003). The high prevalence of hypertension reported in this study, can be attributed to the stressful nature underground mining is associated with and the fact that intense workouts (shoveling and heavy lifting) tend to stress the heart, raise blood pressure for a brief period and cause spasms in the arteries, leading to heart diseases. Moreover, from ambulatory blood pressure studies, high work stress among workers caused high blood pressure (Light *et al.*, 1999). Also, in a study among workers Haiou *et al.* (2006) noted a positive association between hours worked per week and likelihood of having self-reported hypertension case.

Alcohol intake and blood pressure: The research found that 66.9% of the respondents drank alcohol while 33.4% were in the prehypertensive stage (Table 2). This figure recorded in this study is consistent with the findings by Neaton *et al.* (1993) suggested that alcohol intake has an association with the development of hypertension in human populations. Besides, the findings affirm the fact that excess alcohol intake is associated with an average increase of 10% if not all cases of hypertension in middle-aged males (Ward-Law and Kessel, 2002). In the study it was evident that 30.1% of the respondents were hypertensive, when they drank alcohol. This confirms the report that links alcohol intake with increased prevalence of blood pressure (Hedges and Salvo, 1998). As summarized in Table 2, daily consumption of alcohol recorded in 16.8% hypertensive cases. The result agrees with the results of Steven and James (1988) indicated that heavy alcohol consumption has an association with the highest blood pressure as compared to moderate

consumption. Also, Neaton *et al.* (1993) observed that, having more than two drinks of alcohol per day have one-to-two-fold increase in the incidence of hypertension cases compared to non-alcoholic intake. Wine consumption was recorded in 8.4% hypertension cases. This finding can be associated with the protective effect of wine being more consistent than other alcoholic beverages as observed by Gronbaek *et al.* (1995) as a result of phenolic compounds found in wine. High prevalence of blood pressure occurred among respondents who consumed stout, liquor and beer (Table 2). This finding can be attributed to the rate at which they are abused. According to McKee and Britton (1998), when alcoholic beverages are abused the protective changes in HDL are lost. Also, according to Bellentani *et al.* (1997) alcoholic beverage abuse increases the risk of arrhythmias and abdominal fat, which can cause hypertension in humans.

Physical activity level and blood pressure: In this study, less than half (32.8%) and 12.8% of the respondents undertook brisk walking and aerobics exercise, respectively. This study is in line with a study conducted by Jimaina and Van (2001) where low levels of physical activity were recorded among the majority of the respondents. Also, the low level of physical activity among the respondents (Table 3) can be attributed to the ignorance associated with participating in physical exercise among the respondents. This is potentially being because they are not aware of the health benefits associated with physical activity. In this study, respondents who did not partake in brisk walking and aerobics exercise had a higher proportion of high blood pressure. Respondents, who indicated participating in physical activity had low prevalence of hypertension. This is consistent with a WHO (1995) report, suggested that regular physical activity and good physical fitness prevented the development of hypertension in mild-to-moderate degree. Also, the study confirmed findings of other studies, that showed, regular physical activity lowers blood pressure on average by 3/2 mm Hg (systolic to diastolic) and elevated blood pressure of 7/6 mm Hg (Jebb and Moore, 1999).

Dietary habit: In this study, eating habits of the respondents were assessed and it was obvious that, the main cereals consumed as carbohydrate food, were maize, millet and rice. This finding can be linked to the fact that it is the commonest cereals found in the market of the study area and also the fact that, it can be obtained effortlessly, since it is accessible all year round because agricultural research had developed and made available new varieties of cereals that produced higher yields per hectare. Moreover, most families use these cereals in preparing most of their traditional meals including banku, porridge, akple etc. The study also established that, potatoes were the least consumed tuber and cassava the most frequently consumed root tuber, this discovery can be due to the fact that; potatoes are unavailable in most markets and the fact that, its intake has not being put on the needed awareness. With regards to cassava consumption, it is the most cultivated root tuber in the research area and it is available all year round due to good pest management practices by farmers, good rainfall pattern at the time of the research and availability of farm inputs and above all, it is reasonably priced in most markets. Beef, fish and mutton were the most commonly consumed protein. This finding can be associated with the fact that, it is the only animal products that can be assessed easily. In this study, more of the study participants consumed tomatoes, dark green leafy vegetables and oranges as compared to banana pineapple and carrots. This finding can be as a result of the fact that, fruits are unavailable all year round because of post harvest loses, insect infestation, bruising, high temperature and above all, seasonal factors. Also, it can be that the study participants are not aware of the nutritional and health benefits associated with fruits intake.

CONCLUSION

About 41.6% of the respondents were hypertensive with the prevalence of smoking, alcohol intake and less than 8 h of sleep a day were 42.5, 66.9 and 59.7%, respectively. Less than half of the respondents (32.8, 12.8%) participated in brisk walking and aerobic exercise, respectively. The study also established that, potatoes were the least consumed tuber and cassava the most frequently consumed root tuber. Beef, fish and mutton were the most commonly consumed protein. More of the study participants consumed tomatoes, dark green leafy vegetables and oranges as compared to banana pineapple and carrots. Physical activity level, alcohol intake and smoking did not indicate statistical association with blood pressure ($p>0.05$).

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