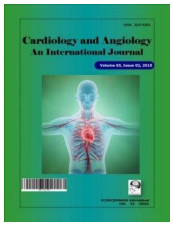

Cardiology and Angiology: An International Journal

8(4): 1-9, 2019; Article no.CA.51244
ISSN: 2347-520X, NLM ID: 101658392

Risk Factors of Cardiovascular Disease among Ghanaian Police Officers

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Authors' contributions

This work was carried out in collaboration among all authors. Authors ME and HEL designed the study, performed the statistical analysis and wrote the first draft of the manuscript. Authors RAA and HEL managed the analyses of the study. Authors ME and RAA managed the literature searches. All authors read and approved the final manuscript.

Article Information

DOI: 10.9734/CA/2019/v8i430109
Editor(s):
(1) Dr. Gen-Min Lin, Division of Cardiology, Hualien-Armed Forces General Hospital, National Defense Medical Center, Taiwan.
Reviewers:
(1) Francesca Gorini, National Research Council, Italy.
(2) Awofadeju Stephen Olajide, Obafemi Awolowo University, Nigeria.
Complete Peer review History: http://www.sdiarticle3.com/review-history/51244

Original Research Article

Received 31 June 2019
Accepted 02 September 2019
Published 09 September 2019

ABSTRACT

Background: Cardiovascular diseases continue to be a global public health burden among occupational groups like Police officers. Police officers play important roles to ensure law and order in countries. However, the nature of police work exposes them to violence and stress. Again, irregular food habits, irregular exercise, inadequate sleep, smoking and drinking are lifestyles which makes police officers prone to high incidence of cardiovascular disease (CVD).
Aim: This study looked at the prevalence of CVD risk factors among police officers in Kumasi, Ghana.
Study Design: Cross- sectional.
Place and Duration of study: Ashanti Regional Police Headquarters, Kumasi, Ghana, between September, 2017 to July, 2018.
Methodology: Weight, height, Body Mass Index (BMI), waist circumference, lipid profile, systolic and diastolic blood pressure of 120 officers were measured. Additionally, lifestyle and dietary factors such as exercise and intake of fruits of Police officers were assessed. Data were analyzed by SPSS version 22.0.

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Results: Slightly more than half (63, 52.5%) of the officers were females and the remaining (57,47.5%) were males. The mean of the various CVD risk factors among the total study participants are as follows; BMI 28.184±4.461 kg/m^2, waist circumference 92.702±10.941 cm, systolic blood pressure (SBP) 128.121±17.047 mmHg, diastolic blood pressure (DBP) 85.569±10.854 mmHg, fasting blood sugar 5.387±1.756 mmol/l, high density lipoprotein (HDL) 1.546±0.211 mmol/l, low density lipoprotein 2.321±0.706 mmol/l (LDL) and total cholesterol (TC) 4.362±0.906 mmol/L. Prevalence of obesity among male and female officers were 43.9% and 36.5% respectively. With regards to hypertension, policemen and women recorded 31.6% and 20.6% respectively and dyslipidemia among males and females were 43.9% and 85.7% respectively.

Conclusion: The officers were generally overweight, with over a quarter having hypertension and about two-thirds having dyslipidemia, making their risk for CVDs high. Further studies to elucidate the causes are required, routine medical screening and nutritional support are recommended.

Keywords: Cardiovascular disease; risk factors; police officers; obesity.

1. INTRODUCTION

Cardiovascular diseases are the leading causes of morbidity and mortality in both developed and developing countries and this affects the productivity of these countries. There are various risk factors of cardiovascular diseases such as high blood pressure, high blood cholesterol, diabetes and obesity of which they are mostly modifiable risk factors [1]. The presence of three or more of these risk factors in an individual can be classified as metabolic syndrome [2].

Police officers constitute an occupational group that is prone to increased prevalence and incidence of cardiovascular disease as a result of the stressful nature of their job [3,4]. Globally, police officers play an important role in our socio-political dispensation by ensuring law and order in society. However, as they discharge their duties, they are exposed to violence, which affect the totality of their health [5]. Currently, police personnel have also been reported to have a high prevalence of obesity and related diseases such as hypertension, hyperlipidemia and sedentary lifestyle which are all contributory factors of CVDs [6]. Therefore, reasons cited for high prevalence of CVDs among police officers include job stress, irregular food habits, lack of regular exercise, inadequate sleep, and unhealthy habits like smoking and drinking [3].

An earlier study by [7], showed that police officers have a shorter lifespan and are 25 times more likely to die from cardiovascular diseases. Hence early detection of modifiable risks factors of metabolic syndrome is most important.

Therefore, the main aim of this study was to determine the prevalence of cardiovascular risk factors among police personnel in Kumasi Metropolis in Ashanti Region of Ghana.

2. MATERIALS AND METHODS

2.1 Study Population

Total sample size was 120 participants. A total number of 63 were female police officers and 57 were male police officers. Cochran's formula was used to estimate the sample size (Cochrane, 1977).

Sample size = Zα/22p (1-p)/e2, Zα/22= the standard score for the confidence interval of 95% which is 1.96.

p = Expected proportion in population based on previous studies is 0.073,
e = Absolute or marginal error of 0.05 for this study.

Using the above, the sample size was calculated as,

Sample size = 1.962×0.073(1-0.073)/0.052,
Sample size = 3.8416×0.073 (0.927)/0.0025,

Giving a Sample size of 103.98 i.e. 104.

With 10% non-response rate added, a total of 120 was required.

2.2 Selection of Participants

Police officers who have been in service for more than one year, who were fairly well by physical observation and officers who gave their consent to the study. Those that were excluded were

pregnant police women and police officers with known cardiovascular disease.

Stratified random sampling was used to sample the number of participants from each unit. Then simple random sampling was used to select participants from each unit.

2.3 Data Collection

A questionnaire was administered which included various sessions such as demographic factors, data on physical activity, dietary intake data, past lifestyles, past physical activity level and anthropometric and biochemical data.

Weight and height of police officers were measured by the research team using a weighing scale and a stadiometer in order to calculate participants' body mass index (BMI). Waist circumference was measured using tailors' plastic tape measure to check the level of central adiposity of participants. Blood pressures of participants were taken using a digital sphygmomanometer (Omron) to measure the systolic and diastolic blood pressures. The measurement was taken twice and an average of the two measurements was taken to represent participants' blood pressure reading. Participants were classified based on the blood pressure classification. These include normotensive (< 120/80 mm Hg), pre - hypertensive (120-139 mm Hg systolic and or diastolic 80-89 mm Hg) and hypertensive > 140/90 mm Hg [8].

Participant's blood samples were taken at their fasting state using a 5ml syringe and 3 mls of the blood sample was put into a serum separator tube for the analysis of lipids. This process was done with the help of qualified phlebotomist. The remaining were dispensed into a sodium fluoride tube for glucose analysis. The blood samples were kept in an ice chest and taken to the Clinical Analysis Laboratory, KNUST where all the analysis was done. The samples in the serum tube were centrifuged at 4000 rpm for 5 minutes and those in the fluoride tube at 3000 rpm for 5 mins to separate the red cells from the serum and plasma respectively. Fasting blood glucose, FBG (mmol/l) was used to classify officers as hypoglycaemic (>3.5), normoglycaemic (>5.6), pre-diabetic (5.6-7.0) and diabetic (>7.0) (ADA, 2010). Serum low density lipoprotein cholesterol (LDL-c) of (≥ 4.12 mmol/L) and total cholesterol (TC) of (≥ 5.18) were classified as high [9]. Weight and height were also measured and used to calculate BMI (weight/square of height in meters). Waist circumference of all officers was taken with a plastic tape.

Metabolic syndrome was characterized by the components defined by the NCEP ATP III. These components include central obesity (waist circumference ≥ 102 cm in men and ≥ 88cm in women), elevated blood pressure (≥ 130 mmHg systolic and or ≥ 85 mmHg diastolic), impaired fasting plasma glucose (≥ 5.6 mmol/L), decreased high density lipoproteins cholesterol (HDL-c) (< 1.03 mmol/L) and elevated triglycerides (≥ 1.7 mmol/L). BMI was used to categorize officers as underweight (>18.5 kg/m2), normal (18.5-24.9 kg/m2), overweight (25-29.9 kg/m2) and obese (>30 kg/m2) [10].

2.4 Statistical Analysis

Data was entered and stored in Microsoft Excel and analyzed using SPSS version 22.0. (SPSS Inc. Chicago.) Binary logistic regression between metabolic syndrome and Socio- demographics, dietary intake and lifestyle activities. Descriptive analysis was used to analyze the characteristics of study participants. T- test was used to compare the parameters of the study. P- value of 0.05 was statistically significant and established. Chi-square were used to compare the various units.

3. RESULTS

Table 1 shows the socio-demographics of police officers. A total of one hundred and twenty (120) police officers took part in the study. Female police officers recorded a slightly higher number of 63(52.5%) with male officers being 57 (47.5%). With regards to the age range distribution of participants. The mean percentage age among police men were 47.5% and females were 52.5%. With respect to length of service experience, 40.8% of respondents had served within the police force for 2-10 years and 35.8% had been in the service for 11-20 years. Also, 17.5% of respondent had between 21-30 years of experience in the service, with 5.0% being within 31-40 years of service and 0.8% of officers had between 41-50 years of service experience.

The mean BMI for the study population was 28.184 kg/m^2 and the mean waist circumference of all participants was 92.702 cm. The mean systolic and diastolic blood pressure were 128.121 mmhg and 85.569 mmhg. The mean fbs reading was 5.387 mmol/l. Table 2 shows the mean of cardiovascular risk factors.

Table 1. Social demographics of police officers

Variable	Total n (%)
Gender	
Male	57(47.5)
Female	63(52.5)
Age	
20-30 years	21(17.5)
31-40 years	47(39.2)
41-50 years	31(25.8)
51-60 years	21(17.5)
Education	
JHS*	16(13.3)
SHS*	52(43.3)
Tertiary	52(43.3)
Marital Status	
Single	34(28.3)
Married	79(65.8)
Divorced	5(4.2)
Widowed	2(1.7)
Religion	
Christian	113(94.2)
Muslim	6(5.0)
Traditionalist	1(0.8)
Length of Service	
2-10 years	49(40.8)
11-20 years	43(35.8)
21-30 years	21(17.5)
31-40 years	6(5.0)
41-50 years	1(0.8)

Data is presented in percentages and frequencies with percentages in parenthesis. JHS means Junior high School and SHS means Senior Secondary School

Table 3 shows the metabolic characteristics of study participants**.** The total prevalence of overweight was 40.0% with obesity recording 33.3% and hypertension was 25.8%. The overall prevalence of diabetes and dyslipidemia was 1.7% and was 65.8% respectively.

Table 4 shows the physical activity levels and intake of fruits among police officers. A greater number of the police officers representing 70.8% of the participants engaged in some form of physical activity whereas 29.2% did not engage in any form of physical activity whatsoever. Regarding the intake of fruit, 25.0% of the respondent consumed fruits daily.

Table 5 shows the dietary pattern of police officers. It was observed that a higher percentage of officers ate twice a day. A higher percentage of the population skip either breakfast or lunch. With respect to breakfast times, it was revealed that a greater proportion of the respondent take breakfast between the hours of 8am-10 am. The study further revealed a higher majority of the study participants ate from outside food vendors that is, foods prepared outside the home. Regarding the intake of fruits, a higher majority of the study population do not consume fruits on regular basis.

Table 6 shows the lifestyle behaviour of participants to this study. It was revealed that 50 police officers out of the 120 police officers alcoholic beverage. Regarding the smoking behaviour of officers, a higher percentage of the police officers did not smoke.

Table 7 shows the binary logistic regression between metabolic syndrome and socio-demographics, dietary intake and lifestyle activities. However, none of the predisposing factors showed a significant p-value with metabolic syndrome.

4. DISCUSSION

In this study, 63 of the respondents representing 52.5% were females whereas 57 representing 47.5% were males. With regards to the level of education among police officers in Kumasi, it was observed that a greater number of the personnel representing 86.6% have attained educational level of either SHS or tertiary. Also, 13.3% of the respondents had attained up to JHS and none of the respondents was an illiterate. This gives a higher probability that the respondent will have basic knowledge in nutrition and consequently influence their eating habits.

The overall prevalence of overweight was 40.0% and hypertension was 34.2%. The total mean BMI recorded for the population was 28.1kg/m^2 and this result is in line with an earlier study carried out by [11], which showed a mean BMI of 27.9 kg/m^2 among police personnel. [12,13], concluded that the high prevalence of obesity and hypertension among police officers were as result of the stressful nature of their work, night shifts, irregular eating habits, excessive sodium intake, sedentary lifestyle, improper regulation of renin-angiotensin-aldosterone activities, excessive peripheral resistance, excessive sympathetic drive and resistance to insulin leads to imbalance of cardiac output and resistance.

Prevalence of dyslipidaemia was 65.8% which was high among the study participants as compared to the prevalence of 45% among non-law enforcers [14]. A similar study carried out by [15], showed 50.3% of the population were having dyslipidemia and reported that dyslipidemia among the police officers are as a result of inadequate intake of fiber rich foods and inadequate physical activity. According to [16],

physical exercise, increased consumption of fiber rich foods, and reduction in the intake of saturated fats reduces low density lipoprotein levels and thus increases high density lipoprotein levels.

With regards to the dietary eating pattern of police officers, most of the police officers were consuming foods prepared outside the home and most of the police officers skipped meals especially breakfast or lunch. Also, the results revealed that majority of the respondents consume foods prepared by food vendors. [17] estimates that police officers consumed foods prepared outside the home more than four days in a week, hence [18], reported that police officers consume more calories because of the high consumption of foods prepared outside the home especially fast foods.

With regards to fruits intake, a greater percentage of the police officers did not consume fruits regularly. This result agrees with a study conducted by [17] which showed that 33%-45% of the police population consumes fruits and vegetables weekly since they perceive that the intake of fruits and vegetables daily is waste of money and will not make them satisfied as compared to consuming their regular daily meals [19].

Table 2. Metabolic parameters among gender of participants

Gender	(Mean±STD)			
Parameter	**Male**	**Female**	**Total**	**p-value**
BMI (kgm2)	26.191±3.621	30.177±5.302	28.184±4.461	0.000*
WC (cm)	91.500±9.906	93.904±11.976	92.702±10.941	0.236
Systolic (mmHg)	132.394±18.141	123.849±15.954	128.121±17.047	0.007*
Diastolic (mmHg)	85.736±11.205	85.402±10.504	85.569±10.854	0.874
FBS (mmol/l)	5.564±1.947	5.211±1.566	5.387±1.756	0.273
HDL (mmol/l)	1.570±0.206	1.522±0.214	1.546±0.211	0.216
LDL (mmol/l)	2.331±0.771	2.311±0.642	2.321±0.706	0.874
Triglyceride (mmo/l)	1.073±0.484	0.998±0.540	1.035±0.512	0.425
Total cholesterol (mmo/l)	4.407±0.944	4.317±0.876	4.362±0.906	0.591

Data represents the mean of the various parameters presented by gender. p-values with represent significance difference between male and female. Significance difference was declared at 95% confidence interval. BMI: Body mass index, WC: Waist circumference, FBS: Fasting blood sugar, HDL: High density lipoprotein, LDL: Low density lipoprotein*

Table 3. Prevalence of cardiovascular risk factors among police officers

Variables	Male n (%)	Female n (%)	Total n (%)	p-value
BMI (kgm2)				
Normal	22(38.6)	10(15.9)	32(26.7)	
Overweight	25(43.9)	23(36.5)	48(40.0)	0.001*
Obesity	10(17.5)	30(47.6)	40(33.3)	
Waist Circumference				
Normal	49(86.0)	22(34.9)	71(59.2)	0.000*
Central Obesity	8(14.0)	41(65.1)	49(40.8)	
Blood Pressure				
Normotension (mmHg)	17(29.8)	31(49.2)	48(40.0)	
Pre hypertension	22(38.6)	19(30.2)	41(34.2)	0.087
Hypertension	18(31.6)	13(20.6)	31(25.8)	
Fasting Blood Sugar				
Normal blood sugar	54(94.7)	62(98.4)	116(96.7)	
Pre diabetes	2(3.5)	0(0.0)	2(1.7)	0.220
Diabetes	1(1.8)	1(1.6)	2(1.7)	
Lipid Profile				
Normal	32(56.1)	9(14.3)	41(34.2)	
Dyslipidemia	25(43.9)	54(85.7)	79(65.8)	0.000*

*Data on cardiovascular risk factors based on gender. They were compared using chi-square test. *Significant differences exist at p<0.05*

Table 4. Physical activity and intake of fruits among police officers

Variables	Male n (%)	Female n (%)	Total n (%)	p-value
Exercise				
Yes	46(80.7)	39(61.9)	85(70.8)	
No	11(19.3)	24(38.1)	35(29.2)	0.039
Kind of exercise				
Brisk Walking	8(14.0)	16(25.4)	24(20.0)	
Jogging	31(54.4)	20(31.7)	51(42.5)	0.019
Push up	6(10.5)	2(3.2)	8(6.7)	
Stomach	1(1.8)	1(1.6)	2(1.7)	
Frequency of Exercise				
Daily	9(15.8)	10(15.9)	19(15.8)	
Weekly(1-3 times)	34(59.6)	28(44.4)	62(51.7)	0.097
Occasionally	3(5.3)	1(1.6)	4(3.3)	
Time spent				
< 30 minutes	6(10.5)	9(14.3)	15(12.5)	
30- 44 minutes	19(33.3)	14(22.2)	33(27.5)	
45min-1 hour	9(15.8)	4(6.3)	13(10.8)	0.092
More than 1 hour	12(21.1)	12(19.0)	24(20.0)	
Frequency of Fruit intake				
Daily	10(17.5)	20(31.7)	30(25.0)	
Weekly	32(56.1)	27(42.9)	59(49.2)	
Monthly	3(5.30)	4(6.30)	7(5.80)	0.278
Occasionally	11(19.3)	12(19.0)	23(19.20)	
Never	1(1.8)	0(0.0)	1(0.8)	

Data is presented categorically with percentage in parenthesis

Table 5. Dietary intake of participants

Variables	Males n (%)	Females n (%)	Total n (%)	p-value
Number of meals in a day				
Once	0 (0.0)	1 (1.6)	1 (0.8)	0.629
Twice	35 (61.4)	39 (61.9)	74 (61.7)	
Thrice	20 (35.1)	22 (34.9)	42 (35.0)	
>Thrice	2 (3.5)	1 (1.6)	3 (2.5)	
Skip meals				
Breakfast	19 (33.3)	29 (46.0)	48 (40.0)	0.316
Lunch	34 (59.6)	29 (46.0)	63 (52.5)	
Supper	4 (7.0)	5 (7.9)	9 (7.5)	
Breakfast time				
5-7am	12 (21.1)	9 (14.3)	21 (17.5)	0.182
8-10am	45 (78.9)	52 (82.5)	97 (80.8)	
11am-1pm	0 (0.0)	2 (3.2)	2 (1.7)	
Eat Outside meals				
Yes	54 (94.7)	58 (92.1)	112 (93.3)	0.416
No	3 (5.3)	5 (7.9)	8 (6.7)	
Frequency of food from vendors				
Daily	40 (68.4)	33 (52.4)	73 (60.8)	
Once a week	6 (10.5)	15 (23.8)	21 (17.6)	0.183
2-3 times a week	7 (12.3)	9 (14.3)	16 (13.3)	
4-5 times a week	3 (5.3)	1 (1.6)	4 (3.3)	
Never	2 (3.5)	4 (6.3)	6 (5.0)	
Frequency of fruits intake				
Daily	10 (17.5)	20 (31.7)	30 (25.0)	
Weekly	32 (56.1)	27 (42.9)	59 (49.2)	0.278
Monthly	3 (5.3)	4 (6.30	7 (5.8)	
Occasionally	11 (19.3)	12 (19.0)	23 (19.20	
Never	1 (1.8)	0 (0.0)	1 (0.8)	

Chi- square was used in analysing the dietary intake of police officers. Categorical data is presented in frequencies and percentages with percentages in parenthesis. Significance difference was declared at 95% confidence interval

Table 6. Lifestyle behaviour of study participants

Variable	Males n (%)	Females n (%)	Total n (%)	p-value
Alcohol intake				
Yes	32 (56.1)	18 (28.6)	50 (41.7)	0.004
No	25 (43.9)	45 (71.4)	70 (58.2)	
Frequency if alcohol intake				
Daily	7 (12.2)	0 (0.0)	7 (5.9)	
Weekly	14 (24.6)	5 (7.9)	19 (15.8)	0.008
Monthly	2 (3.5)	3 (4.8)	5 (4.2)	
Occasionally	9 (15.8)	10 (15.9)	19 (15.8)	
Smoking				
Yes	5 (8.8)	1 (1.6)	6 (5.0)	0.166
No	52 (91.2)	62 (98.4)	114 (95.0)	
Frequency of smoking				
Daily	3 (5.3)	0 (0.0)	3 (2.5)	0.106
Weekly	1 (1.8)	1 (1.6)	2 (1.7)	
Occasionally	1 (1.8)	0 (0.0)	1 (0.8)	

Data is presented categorically in percentages and frequencies with percentages in parenthesis. Significance difference was declared at 95% confidence interval

Table 7. Binary logistic regression between metabolic syndrome and Socio- demographics, dietary intake and lifestyle activities

Variable	B	Sig.	OR	Lower risk	Upper risk
Gender					
Male	-554	0.240	0.575	0.228	1.448
Females			1.000		
Age					
20-30 years	-0.187	0.877	0.829	0.077	8.916
31- 40 years	0.361	0.726	1.435	0.190	10.813
41- 50 years	0.691	0.431	1.997	0.357	11.151
51- 60 years			1.000		
Education					
JHS	-0.285	0.709	0.752	0.168	3.367
SHS	0.054	0.908	1.056	0.420	2.653
Tertiary			1.000		
Marital Status					
Single	0.103	0.949	1.108	0.047	26.224
Married	0.527	0.730	0.591	0.030	11.695
Divorced	0.563	0.771	0.569	0.013	25.426
Number of meals a day					
Once	-22.871	1.000	0.001	0.001	2.123
Twice	-2.016	0.154	0.133	0.008	2.032
Thrice	-2.063	0.145	0.127	0.008	3.431
Foods eaten outside home					
Yes	-0.544	0.548	0.580	0.098	3.431
No			1.000		
Alcohol Intake					
Yes	0.504	0.292	1.655	0.649	4.222
No			1.000		
Smoking					
Yes	0.251	0.805	1.285	0.176	9.391
No			1.000		

*Binary logistic regression among parameters are presented. *Statistical differences exist between means of parameters among categories at $p \leq 0.05$*

Tobacco consumption was observed to be lower among police officers in the study population. Alcohol consumers were high among the study population. [20], showed that those who were active and passive tobacco smokers as well as abusers of alcohol recorded 1.07-1.66 fold higher risk of developing metabolic syndrome.

5. CONCLUSION

Overweight and dyslipidemia had the high prevalence rate of 40.0% and 65.8% and these were the highest contributory risk factors in the development of cardiovascular diseases. However, prevalence of hypertension and diabetes were low recording 25.8% and 1.7% respectively. Routine medical screenings by health experts should be carried out at the various police stations, increase the intake of fruits and vegetables as well as the intake of other fiber rich foods. Strategic measures should be put in place for the police officers to exercise regularly in order to make them stay fit.

CONSENT

The selected participants signed the consent form in accordance to (CHRPE) before their blood samples were taken. Permission and approval was sought from the Regional Police Headquarters of Ashanti Region before embarking on this study.

ETHICAL APPROVAL

Written ethical approval was obtained from the Committee on Human Research Publication and Ethics (CHRPE) of Kwame Nkrumah University of Science and Technology, (KNUST, Ghana) with reference number CHRPE/AP/492/17.

ACKNOWLEDGEMENT

We are grateful to the Ghana Police Service for the cooperation and assistance during data collection at the various police posts.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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The peer review history for this paper can be accessed here:
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