ORIGINAL ARTICLE

Cardiometabolic Risk and its Antecedents among Law Enforcement Officers in Trinidad and Tobago

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ABSTRACT

Objective: *To evaluate cardiometabolic risk and associated lifestyle behaviours among police officers.*

Methods: *Participants completed a validated self-administered questionnaire consisting of socio-demographic, dietary and physical activity items. Following this, blood pressure and anthropometry were measured using standard procedures. Participation in the study was voluntary. The study was approved by the Acting Commissioner of Police, Trinidad and Tobago Police Service.*

Results: *A total of 400 (females = 138; males = 262) officers participated in the study. Male officers were more likely than their female counterparts to have elevated blood pressures, waist circumferences and be smokers. In partial correlation analyses controlling for age, ethnicity, education level and marital status, body mass index was significantly inversely associated with the consumption of vegetables and peas and beans and positively associated with the consumption of sodas and cigarette smoking.*

Conclusion: *Our results indicate that high levels of cardiometabolic risk were associated with unhealthy lifestyle practices among participants.*

Keywords: Cardiometabolic, lifestyle behaviours, police officers, smokers.

INTRODUCTION

Globally, cardiovascular diseases (CVDs) are the leading cause of death among adults (1). In Trinidad and Tobago, over 50% of all visits to healthcare facilities are due to diabetes mellitus, hypertension and their co-morbid conditions (2). While CVDs have heredity components, unhealthy lifestyles (poor diet practices, physical inactivity, use of tobacco, excessive alcohol consumption) contribute to the development of important risk factors including hypertension, insulin resistance, altered serum lipids, and overweight and obesity (3, 4). These represent disorder metabolic processes driven by insulin insensitivity and inflammatory processes that increase the risk of cardiovascular diseases. Metabolic syndrome (the clustering of three or more of these risk factors) is a major cause of coronary heart disease. Overweight and obesity are persistent drivers of cardiometabolic risk (5).

Policing is a demanding and stressful occupation where officers are confronted with death, and threats to their well-being. The shift-based nature of their working hours is known to impact negatively on their ability to implement healthy lifestyle activity practices. It is therefore not surprising to find the rates of cardiovascular ailments are higher among police officers compared to the general public especially at retirement age (6–9). Given the role officers' well-being play in their ability to perform their duties effectively and efficiently, we sought to determine the prevalence of cardiometabolic risk factors and their lifestyle antecedents among officers of the Trinidad and Tobago Police Service (TTPS).

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SUBJECTS AND METHODS

Population

The population of interest consisted of police offers in the eight policing jurisdictions locally.

Sampling and sample size

Four of the eight jurisdictions were randomly selected and officers assigned to these jurisdictions were invited to participate. We assumed that 50% of the police officers have at least one cardiometabolic risk factor. To estimate this with a 5% precision, our calculations suggest that a minimum of 384 officers were required to participate. Altogether 400 officers participated in the survey. Prior to enrolment, the aims and objectives of the research were explained to potential participants. Those giving consent were enrolled. Participation in the study was voluntary. Approval for the study was granted by the Acting Commissioner of Police, TTPS. The study was conducted from September 1, 2013 to March 31, 2014.

Procedure

Anthropometry and blood pressure were measured using recommended procedures (10, 11). Participants' were seated in a quiet room for 10 minutes with the right arm outstretched and palm facing upwards. The upper mid-arm circumference was measured to the nearest 0.1 cm using a non-stretchable plastic tape measure. This was used to select the appropriate size cuff for blood pressure (BP) measurements. Three BP readings were then taken 3 minutes apart using standard procedures with the Omron HEM 712C (10). The average of the last two readings taken was used as the BP for each individual. Weight, height and waist circumference (WC) were measured using standard procedures (11). Percentage body fat (BF%) and lean muscle mass (LMM) were measured with the Omron Full Body Sensor HBF-510W (OMRON Healthcare, USA) according to the manufacturer's procedure manual. Population BF% estimated by these monitors are comparable to those measured with hydrodensitometry and dual-energy X-ray absorptiometry (DXA) (12).

Participants then filled out a questionnaire consisting of socio-demographic items, food frequency and physical activity items. Increased cardiometabolic risks were evaluated as follows: elevated WC of $\geq$ 35 inches (88 cm) for women and $\geq$ 40 inches (104 cm) for men; elevated systolic blood pressure (SBP) $\geq$ 140 mmHg and/or diastolic blood pressure (DBP) $\geq$ 90 mmHg (13). All measurements were taken by an individual trained for the study.

Statistical analyses

Statistical analyses were performed using SPSS for Windows version 23 (IBM Corp., Armonk, NY). Prior to analyses data were checked for deviations from normality. The t-test was used to determine gender differences in continuous variables. Chi-square tests were conducted to determine association for categorical variables. Partial correlation analyses were used to assess the strength of the associations between anthropometric, body composition and physiological variables of interest.

RESULTS

Table 1 shows the socio-demographic characteristic of participants by sex. There were no significant differences in age, ethnicity, non-occupational physical activity level and marital status between male and female participants. Male officers were significantly more likely than their female counterparts to smoke cigarettes (38% *vs* 12%; $p < 0.001$).

They were also more likely than females to have elevated WC (63% *vs* 32.4%; $p < 0.001$), SBP (odds ratio [OR] = 1.80, 95% confidence intervals [95% CI]: 1.07, 3.02; $p = 0.04$) and DBP (OR = 1.62, 95% CI: 1.01, 2.60; $p = 0.005$). A BMI $\geq$ 30 was significantly associated with elevated SBP (OR = 4.4, 95% CI: 2.60, 7.30; $p = 0.001$), DBP (OR = 3.54, 95% CI 2.2, 5.60; $p < 0.001$) and WC (OR = 1.90, 95% CI: 1.63, 2.25; $p < 0.001$). BF% was significantly associated with BMI in males (r = 0.31; $p < 0.001$) and females (r = 0.76; $p < 0.001$).

Table 2 shows anthropometric and physiologic characteristics of officers by sex. Males were significantly taller, heavier and had higher LMM, SBP and WC than females.

Table 3 shows lifestyle practices of participants by sex. Twenty-one percent of participants had adequate levels of non-occupational physical activity at least three times per week. There were no significant gender differences in mean intakes vegetable, fruit, fish, red meat, soda and whole grain. Females were more likely than males to report adequate intakes of legumes (76% *vs* 62%; $p = 0.01$) and vegetables (51% *vs* 40%; $p = 0.03$). Males were significantly more likely than females to consume ready-to-eat meals $\geq$ 4 times weekly (46% *vs* 24%; $p \leq 0.001$). A total of 38% of participants consumed $\geq$ 48 ounces of sodas weekly.

In regression analyses adjusting for age, ethnicity, marital status, education level and money spent

Table 1: Socio-demographic characteristics of participants by sex

Variables	Female (n =138)	Males (n = 262)	*p*-value
Age group (years) (%)			
18–24	46.7	15.3	
25–34	39.9	37.5	
35–44	29.7	23.7	
45+	13.8	23.7	0.14
Ethnicity (%)			
Afro	43.5	32.8	
Indo	20.3	25.2	
Mixed	34.1	38.5	
Other	2.1	3.4	0.14
Marital status (%)			
Single	35.5	34.4	
Married	33.5	36.8	
Divorce	15.2	19.5	
Visiting	5.8	8.46	0.17
Smoking (%)			
No	87.7	61.8	
Yes	12.3	38.2	< 0.001
Non-occupational/Physical activity (%)			
Never	47.8	56.5	
Less than three times	32	22.1	
Three or more times per wk.	18.2	21.4	0.4
Education (%)			
Primary	1.4	1.4	
Secondary	71.71	61.3	
Technical	0.07	10.3	
Tertiary	26.1	22.1	0.9

Table 2: Anthropometric and physiological characteristics of participants by sex

Variable	Female (n = 138) Mean ± SD	Male (n = 262) Mean ± SD	*p*-value
Height (cm)	167.6 ± 15.7	170.6 ± 13.3	< 0.05
Weight (kg)	83.4 ± 17.4	87.7 ± 19.4	0.034
Body mass index (kg/m^2)	30.2 ± 5.5	30.0 ± 6.0	0.78
Percentage body fat (%)	41.8 (9.2%)	35.1 (10.6%)	< 0.001
Lean muscle mass (%)	25.8 (5.8%)	29.8 (6.7%)	0.002
Visceral fat (%)	8 (3.1%)	10.2 (5.4%)	< 0.001
Waist circumference (%)			
> 104 cm male	63.0	32.4	< 0.001
> 88 cm female			
Waist circumference (cm)	79.7 ± 12.3	83.3 ± 15.2	0.02
BMI > 30 (%)	46.7	44.0	0.62
SBP	124.6 ± 14.9	131.7 ± 16.9	< 0.001
DBP	82.5 ± 29.8	83.4 ± 14.4	0.72
Elevated SBP (≥ 140 mmHg) %	17.4	27.5	0.037
Elevated DBP (≥ 90 mmHg) %	23.2	32.5	0.005

BMI = body mass index; SBP = systolic blood pressure; DBP = diastolic blood pressure.

Table 3: Dietary pattern of police officers by gender

Variable	Female (n = 138)	Males (n = 262)	*p*-value
Fish (%)			
Twice a week	42.8	34.0	0.10
PA > 3 times a week Vegetable (%)	19.6	21.4	0.67
≥ 2 servings per day	51.4	39.7	0.03
Fruit (%)			
≥ 2 servings per day	41.31	32.4	0.08
Legumes (%)			
≥ 2 servings per day	75.5	62.1	0.01
Red meat (%)			
≥ 4 servings per week	20.3	29.0	0.07
Ready to eat meals (%)			
≥ 4 times per week	23.9	45.8	< 0.001
Soda (%)			
≥ 4 times per week	32.6	42.0	0.08
Whole grain (%)			
≥ 4 servings per week	18.8	18.3	0.89

on food each month, both BMI and WC were significantly positively associated with number of cigarettes smoked and sodas consumed and inversely associated with the consumption of vegetables, legumes, fish and whole grain products among males. Similarly, BF% was significantly inversely associated with consumption of vegetables, fruit, legumes and time spent in non-occupational physical activity and positively correlated with soda consumption. Diastolic blood pressure was positively associated with number of cigarettes smoked and the consumption of red meats, sodas and ready-to-eat meals. It was inversely associated with the consumption of vegetables, legumes and time spent in non-occupational physical activity. Among females, BMI was significantly inversely associated with vegetable and whole grain intake while WC was significantly positively associated with frequency of cigarette smoking and inversely associated with time spent in non-occupational physical activity, vegetable and whole grain consumption (Table 4).

In regression analyses controlling for age, gender, ethnicity, education level and marital status, BMI ≥ 30 was associated with elevated SBP (OR = 3.82, 95% CI: 2.92, 5.49; $p < 0.01$), elevated DBP (OR = 3.89, 95% CI: 2.88, 5.88; $p < 0.01$), vegetable intakes < 2 servings per day (OR = 1.9, 95% CI: 1.15, 3.14; $p = 0.015$), red meat intake > 4 servings per week (OR = 2.0, 95% CI: 1.04; 2.36; $p = 0.04$), soda intake > 48 ounces per week (OR = 1.9, 95% CI: 1.26, 2.88: $p = 0.002$), and lower participation in non-occupational physical activity < 3 times

Table 4: Correlations between cardio-metabolic and lifestyle factors among officers adjusted for age, sex, ethnicity, education level, marital status and monthly spent on food

Variable	BMI	WC	% Body fat	Systolic BP	Diastolic BP
Cigarette smoking					
Female	0.07	0.21*	0.04	0.05	0.10
Male	0.22***	0.23***	0.07	0.27***	0.27***
Physical activity					
Female	–0.18	–0.22*	–0.10	–0.08	–0.09
Male	–0.24***	–0.25***	–0.23***	–0.11	–0.16*
Vegetable intake					
Female	–0.21*	–0.25**	–0.14	0.02	0.16
Male	–0.25***	–0.25**	–0.19**	–0.12	–0.14*
Fruit intake					
Female	0.03	–0.02	0.04	–0.03	0.05
Male	–0.10	–0.10	–0.15*	0.07	0.006
Peas and beans					
Female	–0.09	–0.01	–0.11	0.07	–0.15
Male	–0.17**	–0.08	–0.18**	–0.13*	–0.14*
Red meat					
Female	0.02	0.04	0.10	0.08	0.18*
Male	0.08	0.10	0.01**	0.21**	0.19**
Fast food					
Female	–0.04	0.03*	0.01	–0.04	–0.03
Male	0.08	0.09	–0.07	0.23***	–0.18**
Sodas					
Females	0.10	0.13	–0.03	–0.16	0.17
Males	0.25***	0.21**	0.14**	0.29***	0.21**
Fish					
Female	0.10	0.04	–0.04	0.06	0.13
Males	–0.14*	–0.015*	–0.10	–0.13	–0.12
Whole grain					
Female	–0.18*	–0.23*	–0.23*	–0.06	–0.03
Male	–0.16*	–0.13	–0.09	–0.09	–0.13

*= $p < 0.05$; ** = $p < 0.01$; *** = $p < 0.001$.
BMI = body mass index; WC, waist circumference; BP = blood pressure.

per week (OR) = 4.70, 95% CI: 3.00, 10.86; $p = 0.001$). Approximately 48% of participants had one or more cardiometabolic risk factors and 7% of them had three of these risk factors. Approximately 43% of participants had BMIs ≥ 30, while 45% of them had WCs above recommended cut-offs.

DISCUSSION

Our results suggest that approximately 48% of participating officers had one or more cardiometabolic risk factors. In fact, obesity was the most prevalent risk factor. This is similar to the findings of studies conducted in other settings (6). Obesity is a consistent risk factor for the development of cardiometabolic diseases such as diabetes mellitus and hypertension, which are major contributors to the development of coronary heart disease (5). Cardiovascular diseases are the major causes of illness and death among law enforcement officers, especially among retirees (14). These results have important implication for monitoring the overall fitness of officers. Fitness is an important perquisite in policing duties, especially the detection and apprehension of criminal elements. Thus, regular monitoring of cardiometabolic risk factor with appropriate interventions is critical to effective and efficient law enforcement (8).

Importantly, these cardiometabolic risk factors were associated with important dietary and physical activity patterns in this population. In particular, consumption of unhealthy components of the diet such as convenience foods and sodas was associated with a greater risk of overweight and obesity, whereas higher consumptions of fruits, vegetables and whole grains were associated with normal weight (15). Similarly, engagement in non-occupational physical activity was associated with a protective cardiometabolic effect in this population. These findings are consistent with what is understood on the role of diet and exercise in aetiology of cardiometabolic diseases (15, 16). However, these may be symptomatic of issues related to the stressful nature of law enforcement. These must be addressed in the context of root causes to have meaningful impacts on the ability of police officers to effectively perform their duties (29, 37). This may be achieved through short educational exercises that address stress and its impact on diet and physical activity. In fact, the TTPS in 2014 has adapted lifestyle programmes to promote well-being among employees. In this regard, attention should be paid to increase risk of hypertension among males as this is the single most important risk factor for illness and death of adults globally (15–17). Hypertension is not only related to one's anthropometric stature but also to the level of stress experienced daily. Such stressful responses are typical for the profession, and therefore point to the need to provide officers with knowledge of coping strategies as part of their training.

Unfortunately, the study failed to include biochemical marks such as total cholesterol, low-density lipoprotein, high-density lipoprotein, triglycerides and glucose as

ethical approval was granted for non-invasive procedures only. However, studies have shown that these are strongly correlated with level of adiposity, diet and physical activity. Notwithstanding, inclusion of biochemical markers in future studies would provide a much better profiling of the extent of cardiometabolic risk (17).

CONCLUSION

Our results indicate that high levels of cardiometabolic risk were associated with unhealthy lifestyle practices among participants. We recommend close post-recruitment monitoring and interventions to reduce the prevalence of these risk factors and promote well-being among officers.

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