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Title: Lifestyle Behaviors and Cardio-metabolic Risk among Police Officers in Trinidad and Tobago

Student Name: Patrice Prout

Project Supervisor: Dr. Selby Nichols

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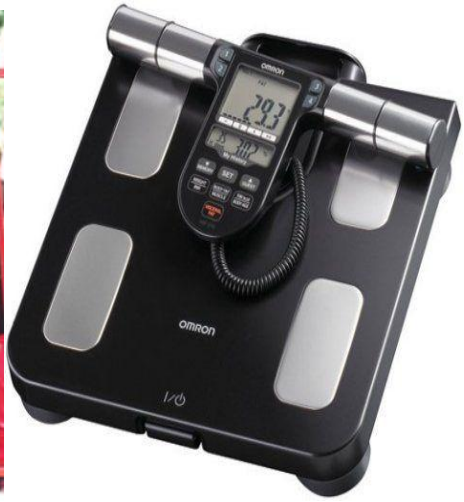
Department of Agricultural Economics & Extension
Faulty of Food and Agricultural

LIFESTYLE BEHAVIORS AND CARDIO-METABOLIC RISK AMONG POLICE OFFICERS IN TRINIDAD AND TOBAGO



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The University of the West Indies,

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Submitted by: Patrice Prout- 810000845

Supervised by Dr Selby Nichols

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TITLE

Lifestyle Behaviors and Cardio-metabolic Risk among Police Officers in Trinidad and Tobago

OBJECTIVES

- To determine the prevalence of cardio-metabolic risk factors among members of the Trinidad and Tobago Police service.
- To determine the whether eating and physical activity patterns are associated with cardio-metabolic risk.

ABSTRACT

Background:

Law enforcement is associated with increased levels of stress that are associated with unhealthy lifestyle behaviors.

Objectives:

In this study, we evaluated cardio-metabolic risk and associated lifestyle behaviors among police officers.

Methodology:

Participants completed self-administered questionnaire consisting of socio-demographic, dietary and physical activity items. Following this blood pressure and anthropometry were measured using standard procedures. Both written and oral consent was obtained prior to enrolment. Participation in the study was voluntary.

Results:

Four hundred (Females 188 and Males 262) officers participated in the study. There were no significant differences in age, ethnicity, education level, and marital status between male and female participants. Males were more likely than females to have an elevated systolic blood pressure (SBP > 130 mmHg) (47.7% vs. 31.2%, $p = 0.01$) and body mass index (BMI > 30) (21.4% vs. 16.5%). BMI and SBP were significantly associated with dietary behaviors and physical activity among participants. In partial correlation analyses controlling for age, ethnicity, education level, marital status, BMI was inversely associated with the frequency of consumption of vegetables ($p<0.001$) and peas and beans ($p = 0.003$) and positively associated with the

frequency of consumption of sodas ($p = 0.001$) and cigarette smoking ($p = 0.001$). Average SBP was positively associated with the frequency of cigarette smoking ($p < 0.001$) as well as the consumption of red meats ($p = 0.03$), fast foods (p,=0.003), and sodas ($p <0.001$ after adjusting for age, ethnicity, education level, marital status and BMI.

Conclusion

My results indicate that high levels of cardio-metabolic risk that is associated with unhealthy lifestyle practices among participants.

INTRODUCTION

Cardio-metabolic diseases such as diabetes mellitus, hypertension, dyslipidemia, physical inactivity, obesity and smoking are major causes of illness and death in the Caribbean (PAHO, 2006). Cardio-metabolic diseases are major determinant of heart disease-the most frequently occurring disease among adults in Trinidadians and Tobagonians (Health Status Report Card 2011; Health in the Americas, 2012 Edition: Country Volume).

Rates for coronary heart disease in Trinidad and Tobago were higher than those observed in Canada and the United States (PAHO 2002). Sixty percent of all death locally was due to cardio-metabolic (PAHO 2002). This in contrast to the situation a few decades ago where infectious diseases were the major causes of illness and death (PAHO 2002) Cardio-metabolic diseases are commonly linked to a set of behavioral and biological risk factors such as obesity, dyslipidemia, high blood sugar, high blood pressure, unhealthy diet, physical inactivity, tobacco consumption, stress, and alcohol abuse (Health Status Report Card 2011).

Cardio-metabolic risk and Metabolic syndrome

Metabolic syndrome is a cluster of cardiovascular disease risk factors and is classified by abdominal or visceral obesity, atherogenic dyslipidemia, elevated blood pressure and insulin resistance (American Heart Association; National Heart, Lung and Blood Institute). An individual is classed as having metabolic syndrome when they pose at least three of the following abdominal obesity with a waist circumference in inches >40 in males and >35 in females, elevated triglycerides of $\geq$ 150 mg/dL or drug treatment for treatment for elevated triglycerides, low high density lipoprotein cholesterol of <40mg/dL in men or <50mg/dL in

women, or drug treatment for such disease, elevated blood pressure of ≥130mmHg systolic, ≥85 mmHg diastolic, or drug treatment for hypertension and impaired fasting glucose of ≥100mg/dL or drug treatment for diabetes (American Heart Association; National Heart, Lung and Blood Institute).

Cardio-metabolic diseases and lifestyle behaviors

It is noted that a number of factors contribute to the problem of non communicable diseases. However one of the major challenges for its increase is the practice of unhealthy lifestyle behaviors. The Caribbean has been faced with drastic changes in the nutritional choices of its adult population. The PANAM Steps Report 2012 indicated that individuals are consuming fewer fruits, vegetables, legumes, whole grains, and cereals, and substituting more processed foods, milk, refined cereals, meats, and sugar. Poor nutrition is further complicated by deficiencies of micronutrients iodine, vitamin A, iron, zinc, and folic acid. At the same time, 30-60% of the population does not achieve the minimum recommended levels of physical activity. (PANAM, 2012) According to the report another factor which has contributed to the increase in cardio-metabolic diseases is the occupational shift from manual labour and agriculture to a highly technological service sector in most of the regions. Meaning that physical activity practices are generally on the decline and steady. This is further aggravated by increased urbanization, motorized transportation, and the introduction of labour saving devices and computers in the home. This coupling of poor diets and sedentary lifestyles is leading to an epidemic of non-communicable diseases among adults (PANAM, 2012).

LITERATURE REVIEW

The Police force represents a unique workforce population that is at increased risk for symptomatic cardio-metabolic diseases (Zimmerman, F.H. 2012). These diseases maybe manifested either during the course of their profession or after retirement. The overall health of these individuals does not only impact their personal life but also their ability to effectively perform their required duties as law enforcement officers. The well being of these persons also has a direct effect on the general health of the country's adult population.

According to the World Health Day report 2013, hypertension or high blood pressure is a leading risk factor for illness and death throughout the world. Furthermore it stated that "Worldwide, over 30% of the adult population has high blood pressure; however, 1 in 3 persons are not aware that they have the disease. Uncontrolled hypertension is the main cause for heart attacks and stroke and can lead to blindness, and kidney failure among other health complications. In Trinidad and Tobago heart disease is the #1 cause of death, and taken together heart disease, cancers, diabetes and stroke account for over 60% of all annually deaths. This is a clear indication that these metabolic diseases have become a challenge amongst the adult population of Trinidad and Tobago. The drastic impact of these diseases within the population is primarily through high rates of cardio-metabolic diseases and death. Presently cardio-metabolic rates are highest amongst groups of individuals that encounter high levels of stress, exhibit increased levels of physical inactivity along with smoking and alcohol consumption.

The global cost of CVD in 2010 was estimated at US$ 863 billion and an average per capita cost of US$ 125, and it is estimated to raise to US$ 1,044 billion in 2030 an increase of 22%. Overall, the cost for CVD could be as high as US$ 20 trillion over a 20-year period and an average per capita cost of nearly US$ 3,000 (A report by the World Economic Forum and the Harvard

School of Public Health September 2011). Elevated rates of cardio-metabolic diseases have increased national health expenditures as the Trinidad and Tobago Government is reported to be spending TT $250,000 on non communicable diseases annually. This increase in disease rate has also been one of the major causes of premature death amongst the adult population resulting in a decline within the country's labor force and a disruption within the family system of society.

In an article published entitled "stress and cardiovascular disease risk in female law enforcement officers policing is considered to be a highly demanding and stressful occupation". (Gershon et al, 2002; Kop and Euwema, 2001; Violanti and Aron, 1994) Traumatic aspects of the occupation which can result from confronting death, violence, and threats to their physical integrity, added to the routines of shift work and working overtime can be added stressors for both male and female officers. Cardio-metabolic disease is reported to be a contributing factor of death among female law enforcement officers (Yoo et al, 2010).

Rozanski et al, 1999 indicated that psychological stress is associated with an increased risk of cardio-metabolic disease thus placing officers as prime targets of this silent killer. They further stated that chronic exposure to occupationally related stress can alter the autonomic nervous system along with neuroendocrine responses to stress. The hypothalamic pituitary adrenal gland is activated when there is an increase in stress above the tolerable level and results in the stimulation of stress related cortisol secretion. This hormonal release has been associated with the development of chronic diseases such as dyslipidemia, abdominal obesity, hypertension and insulin resistance and the further elevation in cardio-metabolic diseases. Male are at increased risk for cardio-metabolic disease because of their decreased estrogen production as compared to female counterparts.

Police officers have a heighten prevalence of conventional cardio-metabolic risk factors such as hypertension, dyslipidemia, obesity, diabetes, smoking, a sedentary lifestyle and job-related stress. All of which frequently coexist to comprise the metabolic syndrome. (Zimmerman, 2012) Zimmerman in his contribution to cardio-metabolic disease and risk factors in law enforcement personnel indicated that an overwhelming body of evidence has established that lipid abnormalities increase the risk of atherosclerosis. The survey further stated that a high percentage of both active and retired law enforcement officers were in fact obesity. The study utilized the body mass index marker of a BMI greater than 25 being overweight and greater than 30 obese. The results indicated that 71-89% of active officers had a BMI $\geq$30 one major factor for this was due to a steady weight gain in officers after graduation from the academy. This weight again resulted in 31-32% of officers having abdominal obesity (Zimmerman, 2012).

Diabetes is a major contributor to cardio-metabolic morbidity and mortality with its death rate among adults 2-4 times that of those without its diagnosis. Type 2 diabetes is considered a coronary risk equivalent (Centre of Disease Control and Prevention, 2011). Diabetes however was less prevalent among the sample size as compared to the general population with 1.5-3.1% of active officers being diagnosed.

Countless evidence links cigarette smoking with all forms of cardio-metabolic diseases. According to Zimmerman 2012, the consumption of tobacco among active law enforcement officers varied greatly. In a survey of nine police states in the United States 36% of the active officers were current cigarette smokers. However among the retired this percentage was higher being reported to be 20.3% in one study and in a later this increased to 54% (Ramey et al, 2009).

One study found metabolic syndrome to be present in 23.1% of 421 active law enforcement officers. It further indicated a relationship between physical inactivity and the presence of

metabolic syndrome. In another survey conducted on 98 Buffalo police officers found an overall prevalence of metabolic syndrome in 16% of the sample size. The shift system of the occupation also increased the officer's risk of developing metabolic syndrome with 30% of officers who were scheduled for the night shift had metabolic syndrome (Violanti et al, 2009).

Physical inactivity is another risk factor for cardio-metabolic disease. Job related physical inactivity and cardio-metabolic morbidity and mortality has an inverse relationship. Law enforcement is predominantly a sedentary occupation; previously walking the beat and bicycle patrol were considered an avenue by which these officers could have performed some form of physical activity while on duty. With the advancement in patrol cars modern policing has become highly technologically driven and desk oriented thus contributing to an increased sedentary lifestyle among officers (Kuntz 1988, Sandra et al 2012, Franke et al. 1994). One study comparing physical activity of new recruits to senior officers in Louisville, Kentucky, revealed that the physical demands of routine police work was insufficient to maintain the required physical fitness. (Stamford. et al, 1978)

Shift work and associated sleep disorders are associated with atherosclerosis and a variety of cardio-metabolic risk factors. (Haupt et al, 2008) These comprise of hypertension, endothelial dysfunction and obesity. Those on routine shifts often display elevated catecholamine levels than those on fixed schedules. Sleep disorders and metabolic syndrome among officers were highest amidst those who worked the over night shifts. (Charles et al, 2007) The study further revealed that such working behaviors also impacted the eating patterns of those involved. Most officers reported consuming excessive calories through the consumption of snack during late night shifts. This practice resulted in weight gain changes in appetite among these officers. This could have

been the consequence of leptin and ghrelin alterations caused by sleep deprivation induced by shift work (Nedeltcheva. et al, 2009).

Non-Communicable Chronic Diseases such as diabetes, obesity, chronic lung disorder, heart disease, stroke and cancer can all be overcome through the adaptation of a healthier lifestyle. This cement was voiced by the Industry Awareness Seminar on Healthy Foods which was hosted by the Trinidad and Tobago Partnership Forum at the Hyatt Regency in Port of Spain. Dr. Fuad Khan minister of Health brought to the table the harsh reality of chronic diseases which has become a major course for concern in Trinidad and Tobago. He further indicated that these diseases if no combated will place a serious strain on the Trinidad and Tobago economy in the future. At present "Ninety per cent of the health budget goes to less than 10% of the population". This is as a result of poor dietary practices, poor lifestyle behaviors such as alcohol consumption, tobacco use and physical inactivity. Dr Khan further stated that the world is facing a tobacco epidemic as well as a CNCD epidemic. Tobacco smoking currently kills 5.4 million people a year from lung cancer, heart disease and other tobacco consumption risk factors. (http://www.news.gov.tt/)

The Trinidad and Tobago police service is one occupation which places it employees at increased risk of cardio-metabolic diseases due to the stressfulness of the profession. Globally studies have shown increased risk of death by cardio-metabolic disease among law enforcement officers. Cardio-metabolic diseases such as diabetes mellitus, hypertension, and coronary disease are the major causes of illness and death among adults in T&T. Given the nature of crime in society law enforcement officer are required to be at optimum levels of fitness and health withstanding, the fact that these individuals are known to be quite stress. Consequently officers develop coping strategies that are sometimes quite unhealthy. In Trinidad and Tobago, at present

there is no reported study on the lifestyle behaviors among officers. Research however is available for the general population which indicates that heart diseases, hypertension and their co-morbid diseases are highest amongst the Caribbean population.

Because of the changes in behavior among the general population and the increase in these cardio-metabolic diseases a number of methods have been established to effectively evaluate the population risk of developing cardio-metabolic diseases. One such method is the use of waist circumference as an indicator of cardio-metabolic risk among both male and female individuals. Waist circumference is a simple measurement used to indicate the need for weight management (Han et al; 1995) and by extension cardio-metabolic risk. Waist circumference has a relation to both body mass index and waist to hip ratios (Han et al; 1995). The study developed two action levels by which waist circumference were to be measured 94-101cm in males and 80-87cm in females were used. Those individuals that had an action level of one were one and a half times to twice as likely to develop one or more major cardio- metabolic risk factor. While those individuals above action level two were two and a half to four and a half times likely to develop one or more major cardio-metabolic risk factor (Han et al 1995). It was therefore concluded that there exist a correlation between waist circumference, waist to hip ratio and body mass index in the evaluating of cardio-metabolic disease risk factor. As such waist circumference is an acceptable method that can be used to examine cardio-metabolic risk factors among individuals however it is not affected by gender, age or ethnicity.

Body mass index (BMI) like waist circumference has been widely used in the assessing of cardio-metabolic disease risk factors among populations. It has been used in diagnosing obesity among diverse populations. A study conducted by Romero-Corral et al, 2008 suggested that despite the unquestionable association between BMI defined obesity and mortality, multiple

studies worldwide have shown that overweight subjects have similar or even better outcomes for survival and cardio-metabolic events when compared to those classed as having normal body weight (Franzosi 2006).

The study concluded that BMI alone has limited diagnostic performance in correctly identifying individuals with excessive body fatness, especially in persons with a BMI greater than 30kg/m^{-2}. Although there exist a good relationship between body fat percentage and BMI, BMI failed to discriminate between body fat percentage and lean body mass especially in male and elderly populations (Franzosi 2006). Therefore the diagnostic accuracy of the BMI in detecting obesity is limited if conducted independently. However if accompanied with simple measurements such as body fatness and body fat distribution the accuracy of results can be enhanced.

RATIONAL

Trinidad and Tobago and by extension the Caribbean is currently limited in studies in the area of cardio-metabolic diseases among law enforcement officers. Research however is available for the general population which indicates that heart diseases, hypertension and their co-morbid diseases are highest amongst the Caribbean population. This research therefore attempts to determine the prevalence of cardio-metabolic risk factors among members of the Trinidad and Tobago Police service and to determine whether eating and physical activity patterns are associated with cardio-metabolic risk.

METHODOLOGY

Population:

The Trinidad and Tobago police service comprises of over 6,500 Police Officers in varying ranks and Special Reserved Police to support the mandate of the Service. The Trinidad and Tobago Police Service is organized into nine Divisions which covers Trinidad & Tobago as well as 18 Branches, Squads and Units (http://www.nationalsecurity.gov.tt)

Sampling:

The researcher first identified the target population after this was done the researcher decided the potential sample size. Permission to conduct the survey was granted by the signature of the Senior Superintendent of the Trinidad and Tobago Police service. After this was obtained the researcher constructed a questionnaire containing twenty-one preset questions accompanied by a three day food log and anthropometric measurements. Since participation was voluntary participants were required to provide both oral and written consent before attempting the survey. Sampling style used was a non randomized study.

Sample Size:

I assumed that 50% of the police officers have at least one cardio-metabolic risk factor. To estimate this with a 5% precision the calculations suggest that at least 384 officers need to participate.

$n = Z^2 pxq/e^2$

n = sample size

z = standard normal value of Z-Score which has a value of 1.96 and 2 at the 95% confidence level respectively.

p = the proportion of the population with the attribute of interest (expressed as a decimal)

e = level of precision or confidence interval

N = (1.96 x1.96 x0.5x0.5) /0.05x0.05 = 384

Object Objectives:

In this study, I evaluated the prevalence cardio-metabolic risk and associated lifestyle behaviors among police officers.

Hypothesis:

Null hypothesis: No relationship exists between nutrition and cardiovascular disease.

Alternative hypothesis: An association exists between nutrition and cardiovascular disease.

Procedure:

On the interview day participants were invited to participate in the survey. The interviewer then explained the study aim and those granting oral and written consent were enrolled. Participants were then provided with a self administered questionnaire containing socio-demographic, dietary and physical activity questions. Following this the participant's blood pressure and anthropometry measurements were taken using standard procedures.

The participant was explained on the procedure of the blood pressure test and was asked to sit quietly with the feet flat with minimal move as possible for approximately 2-3minutes before testing began. The cuff was then placed around the participant's right arm and adjusted to arm size. The first of three readings was obtained, after each reading a 2 second interval was given.

Following this participants were explained the purpose of the BIA machine and its measurement requirements. A brief demonstration of the standing and holding posture during measurement was given. Those consenting to participate were then asked to remove their shoes, sock, belt and service revolver after which their age and height were entered into the calibrated BIA machine. The participant was then placed on the machine when the required results were reviled the participant was removed and the data recorded.

Equipment:

The biometric impedance analysis machine is a widely used method for measuring body composition. It relies on generated current which passes through the body by way of electrodes. Its results are affected by the body's resistance to the current as well as its resistance to it. (http://www.omron-healthcare.com/eu/en/our-products/blood-pressure-monitoring/m6comfort)

The blood pressure machine as it is commonly called consists of a rubber inflatable cuff which is wrapped around the individual's upper arm and is connected to an apparatus that records pressure. (http://www.healthgoods.com/Omron_Body_Logic_Fat_Analyzer_HBF_306_p/on-hbf306.htm)

Statistical Analyses:

The first test used was a two tail test; this is used when two means are being compared. The test divides its 0.05 value in half, meaning that .025 is in each tail of the distribution. Therefore the effect can be either positive or negative and still have a significant statistically significant. The second test utilized was the chi squared test which is used to analyze data characteristically. It is a statistical test that can be used to determine whether observed frequencies are significantly different from expected frequencies.

RESULTS

Table 1 Characteristics of participations by Sex

Variables	**Female**	**Males**	**P**
Age group (years)	**n=138**	**n= 262**	
18-24	23 (46.7%)	40 (15.3%)	
25- 34	55 (39.9%)	98 (37.5%)	
35- 44	41 (29.7%)	62 (23.7%)	
45+	19 (13.8%)	62 (23.7%)	0.14
Ethnicity			
Afro	60 (43.5%)	86 (32.8%)	
Indo	28 (20.3%)	66 (25.2%)	
Mixed	47 (34.1%)	101 (38.5%)	
Other	3 (2.1%)	9 (3.4%)	0.14
Marital Status			
Single	49 (35.5%)	90 (34.4%)	
Married	60 (33.5%)	99 (36.8%)	
Divorce	21 (15.2%)	51 (19.5%)	
Visiting	8 (5.8%)	22 (8.46%)	0.17
Smoking			
No	121 (87.7%)	162 (61.8%)	
Yes	17 (12.3%)	100 (38.2%)	<0.001
Non Occupational Physical Activity			
Never	66 (47.8%)	148 (56.5%)	
Less than 3 times	45 (32%)	58 (22.1%)	
3 or more times per wk	26 (18.2%)	56 (21.4%)	0.4
Education			
Primary	2 (1.4%)	5 (1.9%)	
Secondary	99 (71.71%)	171 (65.3%)	
Technical	1 (0.07%)	27 (10.3%)	

Tertiary	36 (26.1%)	59 (22.5%)	

Table 1 shows the socio-demographic characteristics of participants by sex. There were no significant differences in the age, ethnicity, material status and education levels of male and female participants. Males however were more likely to be smokers than females. While approximately a ¼ of all participants obtained tertiary level training the bulk of which were single and the majority being of afro and mixed descents.

Table 2 Systolic and Diastolic Blood Pressure and Anthropometry of participants by Gender

Variables	Female	Males	P
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	8.1 (3.1%)	10.2 (5.4%)	<0.001
Waist Circumference >40 > 35	 36.2 ($^{+}_{-}$5.8%) 63.0 ($^{+}_{-}$5.8)	 37.9 ($^{+}_{-}$ 6.9) 32.4 ($^{+}_{-}$6.9)	 0.011 <0.001
WC	79.7 (12.3%)	83.3 (15.2%)	0.02
BMI $\geq$ 30	46.7	44.0	0.62
ELESBP	24 (17.4%)	72 (27.5%)	0.037
ELEDBP	32 (23.2%)	86 (32.5%)	0.005

Table 2 shows that males had a significantly higher systolic blood pressure than females. Males were also taller and heavier and had a higher lean body mass, visceral fat and waist circumference than that of females. Females however had significantly higher body fat percentages than males. Male officers were more likely to have elevated systolic and diastolic blood pressures than female counter parts. While female officers were more likely than males

counter parts to have gender specific waist circumferences greater than the recommended cut off points.

Table 3 Dietary and Physical Activity Patterns by gender

Variable	Female	Male	P
Fish Twice a week	59 (42.8%)	89 (34.0%)	0.10
PA ≥ 3 times a week	27 (19.6%)	56 (21.4%)	0.67
Vegetable ≥ 2 servings per day	71 (51.4%)	104 (39.7%)	0.026
Fruit ≥ 2 servings per day	57 (41.31%)	85 (32.4%)	0.08
Peas and Beans ≥ 2 servings per day	104 (75.5%)	163 (62.1%)	0.01
Red Meat ≥ 4 servings per week	28 (20.3%)	76 (29.0%)	0.07
Ready to Eat Meals ≥ 4 times per week	33 (23.9%)	120 (45.8)	<0.001
Soda ≥ 4 times per week	45 (32.6)	110 (42.0%)	0.08
Whole Grain ≥ 4 servings per week	26 (18.8%)	48 (18.3%)	0.89

Table 3 shows females reported higher consumption of vegetables and peas and beans while males were more likely to consume higher amounts of ready to eat meals, red meats and sodas however the later two were not significant. There were no significant differences in the

consumption of whole grain products as well as participating in non occupational physical activity between males and females.

Table 4 Correlations between anthropometric, blood pressure and lifestyle behaviors among participants after adjusting for age, sex, ethnicity, education level and material status and money spent on food each month.

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					
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**

Ready to Eat Meal					
Female	-0.04	0.03*	0.01	-0.04	-0.03
Male	0.08	0.09	-0.07	0.23***	-0.18**
Sodas					
Female	0.10	0.13	-0.03	-0.16	0.17
Male	0.25***	0.21**	0.14**	0.29***	0.21**
Fish					
Female	0.10	0.04	-0.04	0.06	0.13
Male	-0.14*	-0.15*	-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

Table 4 shows that among males BMI was positively associated with cigarette smoking, soda consumption, and associated with physical activity, vegetable intake and waist circumference. Females however had no significant correlation among these. Males however had a negative correlation between body fat and physical activity and a positive association between systolic blood pressure, ready to eat meals and soda consumption.

Personal Interview

In an interview conducted by the medical personnel at the Trinidad and Tobago police medical department indicated that cardio-metabolic diseases such as hypertension, heart attacks and obesity are on the risk among officers. Persons desirous of joining the Trinidad and Tobago police service must undergo rigorous medical screening before acceptance into the service. These individuals must be free of cardio-metabolic disease risk factors therefore the majority of individuals displaying cardio-metabolic diseases have developed such after joining the service. It is his recommendation that officers be allowed adequate vocation time, dietary advice on healthy eating habits and the need for non occupational physical activity.

DISCUSSION

Blood Pressure

In the study 25% and 29.5% of participants had elevated systolic blood and diastolic blood pressure respectively. Males were more likely than females to have elevated blood pressure. This is similar to the findings of several studies. (Reckelhoff; 2001; 37:1199-1208) This is important as elevated blood pressures are major risk factor for heart attacks and strokes (William et al 1970). In fact elevated blood pressure is the single most important risk fact for cardiovascular mortality worldwide (Feng et al 2007). This may require constant monitoring of blood pressure among officers to mitigate these increases (Norris et al, 1990)

Obesity and Waist Circumference

Approximately 45% of participants had BMI $\geq$30. Females were (3.6, 95% CI: 2.3, 5.5; p <0.001) significantly more likely than males to have a waist circumference above the recommended cut-off value. (Helen 2014). Overall 43% of participants had elevated waist circumference. Waist circumference is a good proxy for visceral fat (Ming et at 1997). Visceral fat predicts insulin resistance and development of diabetes mellitus (Ravussin. Et al; 2002, Annals of the New York Academy of Sciences June 2002, Han et al; 1995) Locally over 50% of all health visits are the direct result of diabetes mellitus, high blood pressure and their co-morbid contributors (Gulliford et al 1995, World Health Organization 2003)

Physical Activity

20.8% of participants engaged in non occupational physical activity 3 or more times weekly. Persons engaging in non physical activity < 3 times per week were likely to be obese (OR= 4.7, 95% CI 3.00, 10.86). Regular physical activity is known to decrease over weight and obesity, as well as improve blood pressure, insulin resistance and dyslipidemia (Brown et al 2000, George et al. 2002, R. et al 1993). Given the findings I would suggest regular physical activity and fitness as a mandatory part of performance assessment among officers. At present the Trinidad and Tobago police service lacks such programs available to its members; however the Trinidad and Tobago regiment and Coast Guard has formulated physical activity as part of its programs to ensure fitness among its members.

Dietary Habits

Between 33-45% of participants reported consuming recommended weekly and daily amounts of fruit, vegetable and fish. Overall 2/3 of the sample consumed recommended daily requirement legumes; however 19% of participants reported regular consumption of whole grain products. Our results suggested that BMI was inversely associated with vegetables and peas and beans consumption. These findings may suggest poor dietary practices among overweight and obese persons (Dhingra et al; 2014, Bray et al; 2004; Ruff at el 2014)

Interventions

Purchase of healthy foods for consumption by the offices utilizing the police canteen should be encouraged. Officers should be educated on healthy eating habits by way of training; such intervention methods can have an impact on body weight and level of obesity of officers as well as their ability to perform daily policing activities. Our prevalence of unhealthy eating habits also supports what has been found in the literature. There was also a positive association between BMI and waist circumference, cigarette smoking and soda consumption. (Clarice et al 2000, Virdis et al 2010, Kannel et al 1990)

Conclusion

Among participants' obesity and waist circumference was very prevalent, there was also a significant association between BMI, blood pressure and life style behaviors among participating officers.

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