DOI: https://doi.org/10.4038/sjdem.v16i1.7541

Original Article

Prevalence of Diabetes Mellitus and Its Risk Factors Among Police Officers of Batticaloa Division

Dharshini K[1] , Kogulan T[2] , Pragasan G[3] , Abithra S[1] , Aneez M. M. M[1] , Jananan J[1] , Sahayarajah K[1]

[1] Diabetes and Endocrine Unit, Teaching Hospital, Batticaloa
[2] Department of Clinical Sciences, Faculty of Health-Care Sciences, Eastern University Sri-Lanka
[3] Department of Primary healthcare, Faculty of Healthcare Sciences, Eastern University Sri-Lanka

Abstract

Introduction:
Police officers face unique occupational challenges that may increase their risk of developing Type 2 Diabetes mellitus (T2DM). This study was carried out to find the prevalence of diabetes and other cardio-metabolic risk factors in this group.

Methods:
This was a cross-sectional study covering 124 police officers of Batticaloa division. A pre-tested questionnaire was used for collecting data by medical personnel. Anthropometric, biochemical measurements and definitions of risk factors were carried out using standard techniques. SPSS statistical software was used to analyze the data, and association between risk factors and diabetes was assessed using the Person chi-square test.

Results:
The mean age of the participants was 46.3 years (SD 9.47). The majority (87.09%) were males. The prevalence of T2DM was 22.58% and of pre-diabetes status was 24.5%. Family history of T2DM was noted in 34.7% of subjects. The prevalence of central obesity was 61.1% and of hypertension was 44.35%. According to the National Cholesterol Education Program criteria, metabolic syndrome was detected in 10.4% of the subjects in this study. T2DM was found in 53.84 % of regular smokers while only 28.78% of non-smokers had DM. The association between diabetes and pre-diabetes with other risk factors were not statistically significant.

Conclusion:
Limited sample size and/or genetic predominance would be a reason for the statistical discordance with the available evidence. This study highlights the increased prevalence of risk factors of T2DM and provides insights for targeted interventions within law enforcement institutions.

Keywords: Diabetes mellitus, Risk factors, Police officers, Metabolic Syndrome, Central Obesity, occupational health, prevention.

Correspondence email: kdharshinik@gmail.com

ORCID ID: https://orcid.org/0000-0003-3546-8685

Introduction

Type 2 Diabetes mellitus (DM) is a chronic disease which consumes a greater degree of health care costs. The prevalence of this illness is increasing in low and middle income countries at an alarming rate. Estimated global prevalence of Diabetes Mellitus is 10.5% among adults aged from 20 to 79 years [1,2].

Although the increasing number of patients with DM and their care results in huge economic burden, among the working-age population, cost of lost productivity could exceed well above the disease related medical expenditure. Among the risk factors for developing diabetes, obesity, smoking, unhealthy diet, lack of exercise and socio economic status are considered important factors. In addition, some types of occupation may promote a diabetogenic environment for employees; jobs involving shift work, long sitting time or psychological stress. Police personnel are one such vulnerable group for non-communicable diseases including DM due to irregular hours of work, disrupted sleep patterns, unhealthy dietary style and stressful nature of their work.

Few studies have reported an increased prevalence of cardiovascular disease (CVD) risk factors and type 2 diabetes in this occupational group compared to the general population [3-10].

In Sri Lanka, police officers are required to maintain an optimum level of physical fitness in order to perform their duties. In addition, the availability of special police hospitals and easy accessibility at government hospitals for their health issues, the disease related burden is assumed to be less in this population. But, there are no

similar studies to assess the prevalence and risk factors in our country. Workplace could be a potential arena for primary prevention and an efficient secondary prevention gains in productivity and reduce co-morbidities, we considered conducting this study. Studying the prevalence of risk factors for diabetes in this occupation group at Batticaloa would reflect the gravity of added risk hidden in general public and other occupations that share the same risk factors like night shifts.

Methodology

Study Design:
This study was carried out as part of "World Diabetes Day program 2023". This was designed as a cross-sectional study, aiming to encompass all police officers on duty on October 18, 2023, within the Batticaloa police division.

Data was entered into Microsoft Excel worksheet, and it was analysed using IBM SPSS Statistics (version 27.0). Sociodemographic and clinical characteristics of police offices were analysed using descriptive statistics. If the numerical variable was normally distributed, the mean with standard deviation is used; if the data is skewed, the median with interquartile range was used. Categorical data are presented as frequencies and percentages. The association between risk factors and diabetes were assessed using the Person chi-square test, with a significance level of $p<0.05$.

Project Process:
The approval for the project proposal was obtained from the police headquarters inspector to conduct the research and permission was granted from the director, Teaching Hospital Batticaloa (THB). Ethical approval was obtained from ethical review committee of THB. A structured questionnaire for data collection was devised by the endocrinology team, THB. The questionnaire encompassed details regarding socio-demographic characteristics, anthropometric parameters, medical history, dietary habits, regular physical exercise, and smoking and alcohol consumption status. A pre-tested questionnaire was used for collecting data by medical personnel on the event day.

Anthropometric measurements:
All the participants were examined by a trained team consisting of doctors, medical students and diabetic educators. The team had received training and had been standardized in the measurement assessments. Body weight was measured by a bathroom scale. Standing height was measured with stadiometer and measurement was done to the nearest 0.1 cm. Waist circumference (WC) measured to the nearest 0.5 cm in duplicate according to standard conditions by placing a flexible tape midway between the lowest rib and the iliac crest. The tape did not squeeze or compress the skin and was parallel to the floor. The measurement was taken on, relaxed subjects after gentle expiration. BMI was calculated as the ratio between weight (in kilograms) and the square of height (in meters).

Blood sample collection:
Venous blood samples were collected for fasting blood glucose when participants have a minimum of 8 hours of overnight fasting and rest were collected for random blood glucose. Plasma glucose was estimated using glucose oxidase method.

Definitions:
American Diabetes Association (ADA) diagnostic criteria were used to diagnose Type 2 Diabetes Mellitus (T2DM) and pre-diabetes status as follows. T2DM was defined as fasting plasma glucose (FPG) >= 126 mg/dl or random glucose >= 200 mg/dl and confirmed in two occasions in asymptomatic subjects. Similarly, Pre-Diabetes was diagnosed if FPG 100 - 125 mg/dl or random glucose of 140 - 199 mg/dl.

Hypertension was diagnosed newly when BP >= 140 / 90 mmHg and with the recommendations of the International Society of Hypertension.

Body Mass Index (BMI) values were categorised according to national guidelines that adopt Asian standards: < 18.5 Kg/m^2 as underweight, 18.5 – 22.9 Kg/m^2 as healthy, 23 – 24.9 Kg/m^2 as overweight, 25 Kg/m^2 or more was defined as obesity [11]. Central obesity was defined by waist circumference >= 90cm in men and >= 80cm in women according to Asian standards [12].

The officers were queried about their history of alcohol consumption or smoking, with the frequency of alcohol consumption recorded as either regular or occasional. Regarding smoking, the number of cigarettes consumed per day was documented. Only the current status of smoking and drinking (not past consumption) were taken into the data analysis. Balanced diet, regular exercise and weight management were defined according to recommendations by the national guidelines of Sri Lanka (2021).

Results

A total of 124 police officers participated in this study. The mean age of the participants was 46.33 years (SD = 9.469). Majority (87.09%) of the participants were males and were between the age of 26 and 59 years. The age distribution and sociodemographic characteristics are shown in Figure 1 and Table 1. The prevalence of hypertension, diabetes and obesity among newly screened police officers are shown in Table 2.

Table 1: Sociodemographic and health related characteristics of participants

Characteristics	Numbers	Valid %
Age (Y)	20 - 40	82
	40 – 60	42
Gender	Male	108
	Female	16
History of smoking	40	32.3
History of alcohol use	78	62.9
Family history of diabetes	43	34.7
Past history of diabetes	22	17.7
Night shifts	65	52.4
Regular exercise	47	37.9
Balanced diet	70	56.5

Family history of DM was reported by 34.7% of subjects. Past history of DM was documented in 17.7% and less than half of them had regular clinic follow-up (10 out of 22). Pre-diabetes status was identified in one quarter of newly screened police officers (24.5%) and only 6 cases (5.88%) were newly diagnosed to have DM.

Around one third (32.3%) of the participants had a history of smoking and nearly two third (62.9%) had history of alcohol consumption. The mean BMI of the sample was 24.95 Kg/m^2 (SD = 3.65) and the median was 25 Kg/m2 (Interquartile Range 4.48). The mean and median abdominal circumference were 90.3 cm (SD = 9.2) and 90 cm (interquartile range = 10.8)

respectively. While half of the participants (51.6%) were obese based on BMI, central obesity by waist circumference was documented in 61.1% of subjects. BMI indicates that 22.6% of the population belonged to the overweight category.

Though regular exercise is adhered by 37.9% of the subjects, only 33.1% of police officers have taken additional measures for weight management including diet control, adhering to a healthy diet and/or serial weight assessments. More than half (56.5%) mentioned that they consumed a balance diet for more than one year duration. Night shifts were done by 52.4% of the population on a roster basis. This includes a minimum of 2 nights per week.

In our study population, obesity was not associated with an increased prevalence of pre-diabetes (for BMI P=0.318, for waist circumference: P=0.473) and diabetes (for BMI : P=0.155, for waist circumference: P=0.745). Prevalence of DM was high among smokers (53.84 %) compared to non-smokers (28.78%). But it was not statistically significant (P=0.079).

Alcohol was not associated with the increased prevalence of DM in our study group. (P=0.725). Hypertension was not proven as a risk factor for DM (P=0.87) among newly screened police officers. Routine night shift work was not significantly associated with DM.(P=0.658).

Table 2: Prevalence of diabetes, hypertension and obesity among newly screened participants

		Numbers	Valid %
Blood pressure categories	Previously diagnosed	22	
	Newly diagnosed	44	43
	Normal	58	56.9
Diabetes categories	Previously diagnosed	22	
	Newly diagnosed Pre diabetes (IFS and/ or IGT)	25	24.5
	Newly diagnosed diabetes	6	5.9
BMI categories	Under-weight	6	5.9
	Normal	18	17.6
	Over-weight	26	25.5
	Obesity 1	36	35.3
	Obesity 2	16	15.7
Waist circumference categories	Normal	44	38.9
	Central obesity	69	61.1
	Missing	11	

Discussion

In Sri Lanka, the prevalence of diabetes and obesity has increased and shows regional variations. A systemic review and meta-analysis that included the articles published between January 1990 to June 2022 revealed that the overall pooled prevalence of diabetes in Sri Lanka was 12.07% (95% CI, 8.71% to 15.89%; prediction interval: 1.28–31.35). The pooled pre-diabetes prevalence in Sri Lanka was 5.57% (95% CI, 9.45% to 22.88%; prediction interval: 0.02–49.87). Further, this study has shown that the pooled type 2 diabetes prevalence was the highest in the latest period of 2011–2021 (17.25%) than in the period of 2000s (11.84%) and 1990s (5.62%). [13]

'Data from an urban study' in Colombo district, revealed the overall prevalence of diabetes was 27.6% (95% CI: 23.7-31.4) in 2015 [14]. Estimates from the Sri Lanka Health and Ageing survey in 2018 and 2019 revealed 23.0% of Sri Lankan adults in 2019 had diabetes, using both fasting plasma glucose and oral glucose tolerance test (OGTT) for detection (14.3% previously diagnosed and 8.7% undiagnosed), and overall an estimated 53% of adults had dysglycemia [15].

Our study was carried out to screen police officers for diabetes and related risk factors. Nearly one fifth of participants were already diagnosed with hypertension or diabetes. Among them, less than 50% were attending regular clinic follow up and a significant proportion were not compliant with medications. We found a high prevalence of obesity, central obesity and other risk factors including smoking, alcohol intake, night shifts, poor dietary habits and lack of physical activity among newly screened police officers. Although the examined risk factors were statistically not proven to be associated with diabetes or pre-diabetes. Limited sample size, genetic predominance and other hidden risk factors would be a reason for the statistical discordance with the already available evidence derived from other part of Sri Lanka and other countries. Lipids estimation was not included in this study due to a lack of resources and pragmatic reasons. Metabolic syndrome, a known precursor of cardiovascular morbidity is diagnosed by various criteria. Approximately 10% of the newly screened police officers can be diagnosed to have metabolic syndrome even without the Lipid Profile assessment according to the National Cholesterol Education Program criteria (2005) and thus actual prevalence would be higher than this value [16].

Conclusion

The significant prevalence of diabetes mellitus, hypertension and obesity among our police officers is an alarming finding that requires immense preventive strategies among the police officers of Batticaloa District and demands similar prevalence studies among various target groups and the general population. Since the workplace could be a potential arena for primary prevention and efficient secondary prevention gains in productivity and reduce co-morbidities among occupations that share the same risk factors. This study highlights the increased prevalence of risk factors for diabetes among police officers and provides insights that can inform targeted interventions within law enforcement institutions.

References

1. IDF Diabetes Atlas 2021, 10th edition. (Accessed on May 17, 2024). Available from: *https://diabetesatlas.org/atlas/tenth-edition*.
2. Ong KL, Stafford LK, McLaughlin SA, et al. Global, regional, and national burden of diabetes from 1990 to 2021, with projections of prevalence to 2050: a systematic analysis for the Global Burden of
3. Disease Study 2021. *Lancet 2023*; **402:203**.
   Yoo H. Assessment of contributors to the metabolic syndrome among law enforcement officers. 2011. (Last accessed on 2016 Feb 2). Available from:*http://lib.dr.iastate.edu/etd/11993/.*
4. Ravikumar TS, Kanagarethinam R, Nair D, Kar SS. Are police personnel in puducherry healthy? findings from "Partners in Prevention" Programme in puducherry, India. *Indian J Occup Environ Med 2017*;21:*84*-8.
5. Ramakrishnan J, Majgi SM, Premarajan KC, Lakshminarayanan S,Thangaraj S, Chinnakali P. High prevalence of cardiovascular risk factors among policemen in Puducherry, South India. *J Cardiovasc Dis Res 2013*;*4*:1125.
6. Thayyil J, Jayakrishnan TT, Raja M, Cherumanalil JM. Metabolic Syndrome and Other Cardiovascular Risk Factors Among Police Officers. *North Am J Med Sci 2012*;**4**:6305.
7. Win KN, Balalla NBP, Lwin MZ, Lai A. NoiseInduced Hearing Loss in the Police Force. *Saf Health Work 2015*;**6**:1348.
8. Kumar P, Mallik D, Mukhopadhyay DK, Sinhababu A, Mahapatra BS, Chakrabarti P. Prevalence of diabetes mellitus, impaired fasting glucose, impaired glucose tolerance, and its correlates among police personnel in Bankura District of West Bengal. *Indian J Public Health 2013*;**57**:248.
9. Datta G, Sen A, Das M, Basu S. Prevalence of hypertension and its associated risk factors among Kolkatabased policemen:A sociophysiological study. *Int J Med Sci Public Health 2015*;**1**.
10. AbuAisha H, Elhassan EA, Khamis A, AbuElmaali A. Hypertension and obesity in police forces households in Khartoum. 2015. (Last accessed on 2016 Feb 2). Available from: *http://dspace.uofk.edu/handle/123456789/18101.*
11. WHO Expert Consultation. Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *Lancet.* 2004 Jan 10;363(9403):**157-63**. Doi: 10.1016/S0140-6736(03)15268-3. Erratum in: *Lancet*. 2004 Mar 13;363(9412):902. PMID: 14726171.
12. Jensen MD, Ryan DH, Apovian CM, et al. American College of Cardiology/American Heart Association Task Force on Practice Guidelines; Obesity Society. 2013 AHA/ACC/TOS guideline for the management of overweight and obesity in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and The Obesity Society. *Circulation*. 2014 Jun 24;**129**(25 Suppl 2):S102-38. Doi:10.1161/01.cir.0000437739.71477.ee. Epub 2013 Nov 12. Erratum in: Circulation. 2014 Jun 24;129(25 Suppl 2):S139-40. PMID: 24222017; PMCID: PMC5819889.
13. Akhtar S, Ali A, Asghar M, et al. Prevalence of type 2 diabetes and pre-diabetes in Sri Lanka: a systematic review and meta-analysis. *BMJ*.Open 2023 Aug 28;**13**(8):e068445. doi:10.1136/bmjopen-2022-068445
14. Somasundaram NP, Ranathunga I, Gunawardana K, Ediriweera DS. High prevalence of Diabetes Mellitus in Sri Lankan urban population – Data from Colombo Urban Study. *SJDEM* 2019 Dec 12; **9**(2): 8:15. doi:10.4038/sjdem.v9i2.7393
15. Ravindra Prasan Rannan-Eliya and et al. Prevalence of diabetes and pre-diabetes in Sri Lanka: a new global hotspot– estimates from the Sri Lanka Health and Ageing Survey 2018/2019.
    *BMJ Open Diab Res Care 2023;*11:e003160. doi:10.1136/bmjdrc-2022-003160
16. Huang PL. A comprehensive definition for metabolic syndrome. *Dis Model Mech.* 2009 May-Jun;2(5-6):**231-7.** doi: 10.1242/dmm.001180. PMID: 19407331; PMCID: PMC2675814.