Original article

High prevalence of cardiovascular risk factors among policemen in Puducherry, South India

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ABSTRACT

Background: Diabetes mellitus and hypertension (HT) are common diseases in adulthood, pre-disposing to many cardiovascular complications, posing a major public health challenge. Few studies have reported increased prevalence of cardiovascular disease risk factors and type 2 diabetes in policemen. Hence, this study aims to assess the prevalence of cardiovascular risk factors such as diabetes, HT, smoking, alcohol intake, and obesity among policemen.

Materials and methods: A cross-sectional study was carried out in 2008–2009 among 256 policemen in Puducherry, South India. Policemen were selected by simple random sampling. Socio-demographic details and some of the risk factors such as alcohol intake and smoking history were obtained using a pre-tested, structured questionnaire. Presence of stress was measured using the professional life stress score questionnaire. Blood pressure, waist circumference, and hip circumference were measured by standard methods. Fasting blood sugar was estimated using a glucometer. Serum cholesterol was also measured. Lipid profile was measured for a randomly chosen subgroup of 50 participants.

Results: Mean age of study participants was 40.9 years (SD $\pm$ 10.9). Out of the study subjects, 23% (n = 60) were known diabetic and 16.8% (n = 43) were known hypertensive. Prevalence of diabetes among study participants was 33.6% (CI: 27.8%–39.6%). Prevalence of HT among study participants was 30.5% (CI: 24.9%–36.5%). Seventy percent (n = 178) had at least moderate range of stress in their life related to their profession and 4% (n = 11) had stress as a “problem” in their life.

Conclusions: Burden of cardiovascular risk factors such as diabetes and HT was high among police personnel of Puducherry.

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1. Introduction

Cardiovascular disease (CVD) is the single largest cause for mortality and morbidity in the world. In 2005, CVDs were estimated to be the leading cause of death (30% of all deaths) and much of these deaths occurred prematurely, under the age of 70 years.¹ With the epidemiologic transition, the CVD burden continues to rise in developing countries including India. In India, non-communicable diseases (NCDs) were responsible for 53% of deaths and 44% of disability adjusted life years lost.² Appropriate assessment and management of cardiovascular risk is vital to

prevent fatal and non-fatal heart attacks and strokes and to improve health outcomes in individuals at high risk of cardiovascular events. Risk factors such as hypertension (HT), diabetes, smoking, high blood lipids, physical inactivity, obesity, and a positive family history often occur together and need to be treated comprehensively. Diabetes mellitus (DM) and HT are common diseases in adulthood, pre-disposing to many cardiovascular complications, posing a major public health challenge.

Of the several risk groups for these NCD, police personnel are certainly one, who have long duty hours and experience several other stress and strain. Policemen have irregular diet and limited choice of food while on duty, suffer from disrupted sleep patterns, stress, and have high rates of tobacco and alcohol consumption than the general population. Studies have reported increased prevalence of CVD risk factors and type 2 diabetes in this

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occupational group. Epidemiological studies have been carried out on prevalence on cardiovascular risk factors such as diabetes and HT among general population in India. Very few studies have documented the prevalence of cardiovascular risk factors among policemen. Hence, this study aims to assess the prevalence of cardiovascular risk factors such as diabetes, HT, smoking, alcohol intake, and obesity among policemen.

2. Materials and methods

2.1. Study design and setting

A cross-sectional study was carried out among 256 police personnel residing at police quarters of Puducherry during 2008–2009.

2.2. Sample size calculation and sampling technique

There were a total of 1506 policemen working in Puducherry. Based on prevalence of diabetes (32%) and HT (58.5%) from a study carried out at Chennai, South India, and assuming an alpha error of 0.05 and relative precision of 20%, maximum sample size was found to be 241. Considering non-response, 256 police personnel were selected by simple random sampling. All those selected were contacted at their residence.

Socio-demographic details and some of the risk factors such as alcohol intake and smoking history were obtained using a pre-tested, structured questionnaire. Presence of stress was measured using the professional life stress score questionnaire.³ During the course of the interview, the individual survey physician made two measurements of blood pressure on each study participant with a mercury column sphygmomanometer (Diamond Co., Industrial Electronics and Allied Products, Electronics Cooperative Estate, Pune, Maharashtra, India) using a standardized technique.⁴ Height and weight of the individual using a weighing machine and stadiometer were measured to the sensitivity of 0.1 cm and 100 g, respectively. Waist circumference and hip circumference were measured using a non-stretchable measuring tape. After measurement, they were informed about fasting blood sugar (FBS) estimation the very next morning. FBS was estimated using a glucometer and a one-touch strip. Fasting blood sample was also collected to measure the serum cholesterol for all the participants and lipid profile for a randomly chosen subgroup of 50 participants. Blood samples were analyzed for serum cholesterol and lipid profile. The study was conducted in compliance with “Ethical Principles for Medical Research Involving Human Subjects” of Helsinki declaration. Confidentiality of each participant was ensured.

2.3. Diagnostic criteria

FBS of 126 mg or more was considered as DM and fasting blood glucose between 110 and 125 was considered as impaired glucose tolerance.⁵ For HT, mean of two readings of blood pressure measurements was considered.⁶ HT was defined as either systolic blood pressure of 140 mm of Hg or more or diastolic blood pressure of 90 mm of Hg or more.

2.4. Statistical analysis

Data were entered into Microsoft excel spread sheet. Data analyses were carried out using SPSS 17.0. Mean and proportions were calculated. Chi-square test was used to compare proportions and multivariate analysis was conducted to identify the risk factors for diabetes and HT.

3. Results

A total of 256 police personnel were included in the study. Socio-demographic characteristics and work experience of the participants are described in Table 1. The mean age of study participants was 40.9 years (SD $\pm$ 10.9) and 97.7% of the study participants were males. Mean duration of service as policemen was 16.3 years (SD $\pm$ 11.7). Most of them (67%) were working as police constables.

Out of the study subjects, 23% (n = 60) were known diabetic and 16.8% (n = 43) were known hypertensive. Prevalence of diabetes among study participants was 33.6% (CI: 27.8%–39.6%). In addition, 69.8% (60) of them were known diabetic on treatment and 30.2% (26) were newly diagnosed during the study. About 87% (75) of diabetics were in the age group of 40–59 years. Prevalence of diabetes was low as expected in the 20–29 years age group (1.6% CI: 0.04%–8.4%). With age, prevalence of diabetes increased from 11.6% in the 30–39 years age group to 45.3% in the 50–59 years age group; this increase is statistically significant (P < 0.001). Seven percent (18) of participants had impaired glucose tolerance.

Prevalence of HT among study participants was 30.5% (CI: 24.9%–36.5%). Forty-five percent (35) were newly detected and 55.1% (43) were known hypertensive. Prevalence of HT was highest among police personnel who were above 50 years of age (46%, CI: 33.4%–59.1%). Prevalence of HT increased with increase in the age and Chi-square for trend is significant (P value < 0.001).

Using body mass index (BMI) cutoff values for Asian Indians, 51.6% of police personnel were found to be obese (BMI $\geq$ 25 kg/m²) and 25.4% were overweight (BMI 23.0–24.9). 27.3% of the participants had cholesterol level higher than the desirable level of 200 mg/dL. Waist circumference is also an important measurement of central obesity. Among the study participants, 71.5% had waist circumference suggestive of central obesity based on their gender-specific values. Another measure of central obesity is the waist hip ratio (WHR). Around 91.4% of police personnel had WHR higher than the gender-specific normal values.

Seventy percent (n = 178) had at least a moderate range of stress in their life related to their profession and 4% (n = 11) had stress as a “problem” in their life. Of the study personnel 45.7% (n = 117) had a history of alcohol consumption during the last 1 month and 23% (n = 59) had a history of tobacco smoking at least for a period of 1 month from the date of interview [Table 2]. Mean durations of

Table 1

Demographic and occupational characteristics of study participants (N = 256).

Characteristics	Number	Percentage
Age category (years)		
20–29	64	25.0
30–39	41	16.1
40–49	88	32.4
50–59	63	24.6
Gender		
Male	250	97.7
Female	6	2.3
Designation of the police personnel		
Inspector	7	2.7
Sub-inspector	14	5.5
Assistant Sub-inspector	5	2.0
Head constable	54	21.1
Police constable	166	65.6
Others (Wireless operator, Bigular, Barber)	10	3.9
Years of experience (years)		
1–10	101	39.5
11–20	55	21.5
21–30	60	23.4
31–40	40	15.6

Table 2
Prevalence of cardiovascular risk factors among police personnel (N = 256).

Cardiovascular risk factors	Number	Percentage
History of alcohol consumption		
Absent	139	54.3
Present	117	45.7
Smoking history		
Absent	197	77.0
Present	59	23.0
Diabetes mellitus		
Yes	86	33.6
Impaired glucose tolerance	18	7.0
No	152	59.4
Hypertension		
Yes	78	30.5
No	178	69.5
Body mass index (kg/m ²)		
Normal (18.5–22.9)	59	23.1
Overweight (23.0–24.9)	65	25.3
Obese (25.0 and above)	132	51.6
Waist circumference		
Normal (<90 cm for men and <80 cm for women)	73	28.5
High (≥90 cm for men and ≥80 cm for women)	183	71.5
Total cholesterol		
Normal (<199 mg/dL)	186	72.7
High (≥200 mg/dL)	70	27.3
Stress		
Stress is not a problem	78	30.5
Moderate range of stress present	167	65.2
Stress is a problem	11	04.3

smoking and alcohol consumption were 13.1 years (SD ± 13 years) and 9.8 years (SD ± 9.5 years), respectively.

Prevalence of metabolic syndrome using the definition of International Diabetes Federation⁷ was 70% (CI: 53.5%–83.4%). Using ATP III Asian Indian cutoffs⁸ for waist circumference, prevalence of metabolic syndrome was found to be 48% (CI: 33.7%–62.6%) among the study participants.

Multiple logistic regression analysis was carried out to determine the association between diabetes (new and old) and independent variables such as age, gender, HT, BMI, waist circumference, and stress. Initially, each independent variable was regressed against each dependent variable. Variables with a minimum *P* value of 0.25 were considered for multiple logistic regression analyses. In multivariate analysis, non-modifiable risk factors such as age (adjusted odds ratio 1.15, 95% CI 1.1–1.2) and female gender (adjusted odds ratio 7.79, 95% CI 1.09–55.82) were significantly associated with diabetes [Table 3]. Similarly in multivariate analysis, non-modifiable risk factor such as age (adjusted odds ratio 1.15, 95% CI 1.1–1.2) and modifiable risk factors such as BMI

Table 3a
Risk factors for diabetes by multivariate analysis.

Variables	Adjusted odds ratio	95% Confidence interval	<i>P</i> value
Panel A dependent variable: diabetes compared to normoglycemic subjects			
Age	1.15	1.1–1.2	<0.001
Gender			
Male	1	—	—
Female	7.79	1.09–55.82	0.04
Blood pressure			
Normal	1	—	0.16
Hypertension	1.64	0.82–3.29	
Body mass index	1.02	0.95–1.09	0.61
Total serum cholesterol	1.00	0.99–1.01	0.53
Waist circumference	0.99	0.96–1.03	0.79
Stress			
Stress-not a problem	1	—	—
Presence of some stress	0.59	0.29–1.21	0.15

Table 3b
Risk factors for hypertension by multivariate analysis.

Variables	Adjusted odds ratio	95% Confidence interval	<i>P</i> value
Panel B dependent variable: hypertension compared with normal blood pressure			
Age	1.07	1.03–1.11	<0.001
Gender			
Male	1	—	—
Female	0.37	0.05–3.74	0.04
Fasting blood glucose (FBG)			
FBG < 126 mg	1	—	0.09
Diabetes mellitus	1.78	0.92–3.45	
Body mass index	1.13	1.02–1.26	0.02
Total serum cholesterol	1.00	0.99–1.01	0.82
Waist circumference	0.98	0.94–1.02	0.34
Stress			
Stress-not a problem	1	—	—
Presence of some stress	2.89	1.42–5.84	0.003

FBG = Fasting blood glucose.

(adjusted odds ratio 1.13, 95% CI 1.02–1.26) and stress (adjusted odds ratio 2.89, 95% CI 1.42–5.84) were significantly associated with HT [Table 3].

4. Discussion

This study has shown a high prevalence of cardiovascular risk factors in this specific occupational group. Prevalence of DM and HT was 33.6% and 30.5%, respectively. Around 45.7% (*n* = 117) had a history of alcohol consumption and 23% (*n* = 59) had a history of tobacco smoking during the last 1 month. More than half (51.6%) of police personnel were obese.

The prevalence of diabetes among police personnel in this study was 2.5 times that of the prevalence reported in southern India: 13.5% in Chennai, 12.4% in Bangalore, and 16.6% in Hyderabad (as per National Urban Diabetes Survey) based on WHO criteria.⁹ Another study by Tharkar has reported that the prevalence of diabetes among police personnel was 32% compared to 20% in the general population.¹⁰ Diabetes is a risk factor for CVD and stroke; it increases the risk of ischemic heart disease by 2–4 times.¹¹ Therefore, regular screening for DM and its risk factors will help identify the disease early and help in preventing or delaying the complications of diabetes.

In the present study, the prevalence of hypertension (HT) among police personnel was 30.5% compared to 58.5% in police personnel in a study conducted by Shabana et al, which used the BP cutoff as 130/85 mmHg. In India, the prevalence of HT among adults more than 20 years old was estimated to be 15.9%.¹² Prevalence of HT among police personnel in the present study was found to be two times higher than that of the general population, which is surprising as police personnel are involved in regular physical activity. HT increases the risk of CVD by 4.57 times, stroke by 10 times, end-stage renal disease by 1.65 times,¹³ and congestive cardiac failure by 2–4 times.¹⁴ One of the cornerstones of the primary prevention of CVD has been screening for high blood pressure and anti-hypertensive drug treatment.¹⁵ This approach has to be implemented in this high risk occupational group of police personnel too.

The prevalence of overweight based on BMI (BMI > 23) is higher among police personnel (75.8%) compared to the general population (35.4%). Prevalence of overweight based on a BMI cutoff greater than 23 kg/m² in our study was similar (75.8%) to that in the study of Shabana et al (62.9%). However, prevalence of overweight using WHO cutoffs (BMI > 25) was higher among the Puducherry police personnel compared to a study carried out in police officers of Mexico.¹⁶ Abnormal waist circumference in the present study was

71.5%, compared to 65.1% among police personnel (Waist Circumference > 90 cm) in the study carried out by Shabana et al.

Working under tremendous pressure and stress may make police personnel alcohol and smoking dependent.¹⁷ The present study also showed alcohol and smoking habits to be highly prevalent in policemen. The prevalence of smoking and alcohol consumption (23% and 45.7%, respectively) in the present study was similar to that found in the study by Shabana et al (22.6% and 31.1%, respectively); however, it was higher than the prevalence among the general population (20.7% and 11.0%, respectively). Similar to other Indian studies carried out among the general population, the present study also did not show a statistical association of history of smoking and alcohol consumption with diabetes.^{18–20} However, research has established evidence beyond doubt that smoking is a leading cause for coronary artery disease and is related to glucose intolerance and diabetes.^{21,22} More than 65% have a moderate range of occupation-related stress, although it was not statistically associated with diabetes among police personnel. However, Norberg et al and Agardh et al reported an association between work-related stress and significantly increased risk of diabetes.^{23,24} It is important to take appropriate prevention strategies to reduce the stress associated with this occupation. This can be done by periodically monitoring the mental health component of the police personnel and implementing relaxation exercise or sanctioning the rotation of duty hours.

This study has tried to comprehensively assess cardiovascular risk factors in an occupational group by assessing bio-chemical parameters such as blood sugar and total cholesterol along with behavioral and anthropometric risk factors. Information on behavioral risk factors and anthropometric risk factors was collected by a trained public health person, which adds to the credibility of the study. Physical inactivity, an important risk factor for CVD, was not measured in this study. Information on physical activity would have explained the high levels of obesity and diabetes in this study population. Lipid profile was carried out for only 50 participants, which is limitation of this study.

Although police personnel are considered to be at high risk for DM and HT (CHD), they are not given adequate attention compared to other organized sectors, e.g. Employment State Insurance scheme for factory workers. After recruitment into the police department, it was observed that annual or biannual health checkups were not given emphasis. NCDs are expensive to treat. Strategies have to focus on prevention and health promotion as key to reduce disease burden among police personnel. Health education programs that promote exercise, weight reduction, early diagnosis, and screening are some of the key interventions that need to be promoted. The National Program for Prevention and Control of Cancer, Diabetes, CVD and Stroke, which is in the implementation phase in selected districts of India, will benefit this high-burden group.²⁵

5. Conclusion

The burden of cardiovascular risk factors such as diabetes and HT was high among police personnel of Puducherry. Other risk factors such as obesity, smoking, and alcoholism also need attention in this occupational group.

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Conflicts of interest

All authors have none to declare.

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