

# Metabolic Syndrome and Cardiovascular Risk Factors in Police Officers

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## ABSTRACT

**Introduction:** Police officers are facing enormous stress due to unpredictable working hours, irregular diet, disrupted sleep patterns, and different types of physical and mental disorders. The present study was conducted to evaluate the risk factors for the development of cardiovascular disorders, metabolic syndrome (MetS), and diabetes mellitus in police officers.

**Materials and methods:** The study included a total of 800 participants (400 policemen and 400 controls). Along with questionnaire, biochemical, and anthropometric measurements were included in the present study.

**Statistical analysis:** SPSS was used for statistical analysis.

**Results and conclusion:** Present study reported increased risk factors like dyslipidemia, hypertension, obesity, and diabetes mellitus, which are predisposing factors for the development of cardiovascular disease (CVD) and MetS.

**Keywords:** Cardiovascular disease, Diabetes mellitus, Dyslipidemia, Hypertension, Metabolic syndrome, Risk factors.

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## INTRODUCTION

Industrialization is leading to the transition of people's economy and lifestyle. Prevalence of noncommunicable diseases like CVD, MetS like diabetes mellitus, which ranges from 2% to 3% in rural areas is as high as 18% in urban India.<sup>1,2</sup> However, it is as high as 31% in developed countries.<sup>3</sup> Metabolic syndrome is a cluster of risk factors, including dyslipidemia, abdominal obesity, reduced glucose tolerance, and hypertension. MetS increases the risk of myocardial infarction, CVD, and risk of cancers by twofold.<sup>4,5</sup>

The physical health, psychological trauma (injury, violence), safety, irregular diet, limited choice of food while on duty, overtime, disrupted sleep patterns, and efficiency are important features in police officers.<sup>6</sup> They are at constant stress with a high rate of smoking and alcohol addiction.<sup>7,8</sup> Male workers have a higher prevalence rate of hypertriglyceridemia and female workers at a higher rate of hypertension.<sup>9</sup> Job strain is significantly related to heart rate variability,<sup>10</sup> increased fasting glucose,<sup>11</sup> dyslipidemia, and arterial hypertension.<sup>12,13</sup> The stress in police officers is due to effort-reward imbalance (ERI),<sup>14</sup> leading to physical and mental disorders.<sup>15,16</sup>

Therefore, the present study was conducted among the police officers, who attended a routine annual health checkup, to evaluate and determine the prevalence and associated risk factors for the development of diabetes, MetS, and CVD.

## MATERIALS AND METHODS

A case-control study was conducted at Koppal Institute of Medical Sciences, Koppal. A total of 800 (police officers 400 and general population (GP) 400) between 30 years and 50 years were included in the study. The two groups were similar in demographic characteristics and differed only in occupation. The proforma included anthropometry, blood pressure, biochemical parameters, past medical history, brief dietary details, smoking, and alcohol status. Body mass index (BMI) (weight in kg/height in m<sup>2</sup>) was

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**Conflict of interest:** None

calculated. Written consent was obtained from the subjects and approval from the ethical committee of the institution.

## Blood Collection and Biochemical Estimations

Venous blood samples were collected after a minimum of 8 hours of overnight fasting. Blood was collected in an oxalate-fluoride tube for glucose estimation using a glucose oxidase method. Fasting serum sample was used for the estimation of lipids, including total cholesterol, triglycerides, and high-density lipoprotein cholesterol (HDL-C). Low-density lipoprotein (LDL) was calculated by Friedewald formula. All the biochemical estimations were done using enzymatic procedures within 5 hours, and Erba XL 640 autoanalyzer was used for all assays. Diagnosis of diabetes mellitus was made on the basis of the WHO definition. Diagnosis of the MetS was made, using IDF definition and presence of MetS was confirmed when three or more of the following risk factors are present; waist circumference:  $\geq 90$  cm (specific for Indians); blood pressure: 130/85 mm Hg; fasting plasma glucose ( $\geq 100$  mg/dL); triglycerides  $\geq 150$  mg/dL;

HDL-C <40 mg/dL. The other risk factors taken were BMI ( $\geq 25$  kg/m<sup>2</sup>) and total cholesterol ( $\geq 200$  mg/dL).

**STATISTICAL ANALYSIS**

SPSS was used for statistical analysis. Mean and standard deviations were calculated for continuous variables. Prevalence is reported in percentages. Students “t” test/Chi-square test were used as appropriate to test statistical significance. The *p* value of <0.05 was considered as significant.

**RESULTS**

Present study showed increased prevalence of consumption of alcohol (GP; 17% vs police 56.5%), tobacco (GP; 14% vs police officers 20.75%), and smoking (GP; 30% vs police officers 70%) in police compared to the GP. The prevalence of MetS (GP; 18.3% vs police officers 29.5%), type 2 DM (GP; 19.6% vs police officers 36.4%), and hypertension (GP; 22.5% vs police officers 52.6%), were also high in police compared to the GP (Table 1).

Present study shows increased BMI (GP;  $22.1 \pm 3.1$  vs police officers  $25.1 \pm 2.4$ , *p* < 0.001) and increased waist circumference (GP;  $70.4 \pm 8.2$  vs police officers  $88.2 \pm 10.4$ , *p* < 0.0001) are the two most highly prevalent abnormalities among the police.

Prevalence of dyslipidemia with increased total cholesterol (GP;  $167.3 \pm 30.4$  vs police officers  $198 \pm 49.2$ , *p* < 0.001), triglycerides level (GP;  $132.3 \pm 95.1$  vs police officers  $168.6 \pm 108.6$ , *p* < 0.001), increased LDL (GP;  $86.2 \pm 12.4$  vs police officers  $118.3 \pm 16.5$ , *p* < 0.001), very low density lipoprotein (VLDL) (GP;  $21.3 \pm 13.1$  vs police officers  $48.2 \pm 12.7$ , *p* < 0.001) and decreased HDL (GP;  $46.7 \pm 4.1$  vs police officers  $30.6 \pm 6.4$ , *p* < 0.001).

**Table 1:** Prevalence of cardiovascular disease risk factors in police officers and controls

Characteristics	General population (n = 400)	Police (n = 400)
Smoking	120 (30%)	280 (70%)
Alcohol	68 (17%)	226 (56.5%)
Tobacco	56 (14%)	83 (20.75%)
Metabolic prevalence	18.3%	29.5%
Type 2 DM	19.6%	36.4%
Hypertension	22.5%	52.6%

There was an increased prevalence of hypertension among the police officers with systolic blood pressure (GP;  $122.2 \pm 10.4$  vs police officers  $146.4 \pm 16.4$ , *p* < 0.001) and diastolic blood pressure (GP;  $76.2 \pm 10.2$  vs police officers  $92.2 \pm 12.4$ , *p* < 0.001) (Table 2 and Fig. 1).

**DISCUSSION**

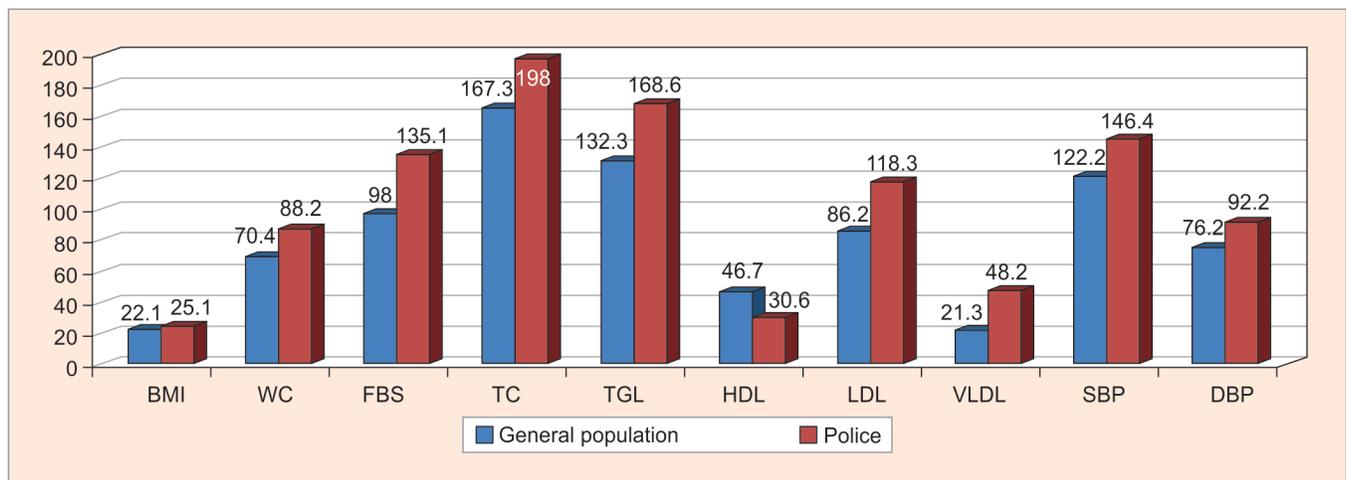
Many previous studies have indicated that lifestyle and stress lead to MetS.<sup>17,18</sup> Present study showed an increased prevalence of smoking, alcohol consumption, and tobacco chewing in police officers compared to the GP. Similar observations were made by Tharkar et al.,<sup>1</sup> and Ganesh et al.,<sup>19</sup> with a prevalence of smoking in 21.6% and alcohol in 50.3%, respectively. Other studies have also observed a high rate of addiction to alcohol and smoking habits due to tremendous work pressure in police officers.<sup>20,21</sup>

Prevalence of diabetes mellitus was also higher in police officers compared to GP. Similar observations were made by Tharkar et al.,<sup>1</sup> Amah-Tariah et al.,<sup>22</sup> and Ganesh et al.,<sup>19</sup> with diabetes in 32.1%, 21.4%, and 10.1%, respectively; according to Amah-Tariah et al.,<sup>22</sup> diabetes was seen in 36% of females and 16% of male.

Present study showed dyslipidemia among police officers compared to GP. Similar findings were seen by Garbarino and

**Table 2:** Anthropometric and biochemical details in police officers and controls

Variables	General population (n = 400)	Police (n = 400)	<i>p</i> values
Age (years)	$40.2 \pm 10.1$	$38.2 \pm 11.1$	0.21
BMI (kg/m <sup>2</sup> )	$22.1 \pm 3.1$	$25.1 \pm 2.4$	<0.001
Weight circumference	$70.4 \pm 8.2$	$88.2 \pm 10.4$	<0.0001
Fasting blood sugar	$98 \pm 10.2$	$135.1 \pm 50.2$	<0.001
Total cholesterol	$167.3 \pm 30.4$	$198 \pm 49.2$	<0.001
Triglycerides	$132.3 \pm 95.1$	$168.6 \pm 108.6$	<0.001
HDL	$46.7 \pm 4.1$	$30.6 \pm 6.4$	<0.001
LDL	$86.2 \pm 12.4$	$118.3 \pm 16.5$	<0.001
VLDL	$21.3 \pm 13.1$	$48.2 \pm 12.7$	<0.001
SBP	$122.2 \pm 10.4$	$146.4 \pm 16.4$	<0.001
DBP	$76.2 \pm 10.2$	$92.2 \pm 12.4$	<0.001



**Fig. 1:** Prevalence of various characteristics among police officers and controls

Magnavita,<sup>23</sup> Saha et al.,<sup>24</sup> and Puustinen et al.,<sup>25</sup> Amah-Tariah et al.,<sup>22</sup> also showed reduced HDL cholesterol (38.8%) and elevated waist circumference (30.6%).

Psychological stress is a significant predictor of decreased HDL levels and increased triglyceride levels. These findings were significantly high in men as compared to women.<sup>26,27</sup> Dyslipidemia is a risk factor for the development of atherosclerosis and coronary heart disease.<sup>23</sup>

There was a high prevalence of hypertension in police officers compared to GP in the present study. Similar observations were made by Ganesh et al.,<sup>19</sup> Ashwin et al.,<sup>28</sup> (34.5%) and Ramakrishnan et al.,<sup>29</sup> (30.5%) and Saha et al.<sup>24</sup> High prevalence of blood pressure and total cholesterol, are seen in 43% of females as compared to 36% in male.<sup>22</sup>

Other risk factors associated observed were obesity and high levels of stress. Similar observations were also made by Ganesh et al.,<sup>19</sup> Hooper et al.,<sup>30</sup> and Amah-Tariah et al.<sup>22</sup>

## CONCLUSION

Present studies reveal those police officers due to high stress, improper diet, and disturbed sleep have a significantly higher BMI, waist circumference, hypertriglyceridemia, alcohol consumption, tobacco chewing, and high blood pressure compared with the GP, which are considered as high-risk factors for the development of MetS, CVD, and diabetes mellitus.

## CLINICAL SIGNIFICANCE

Police officers will get the awareness of the various diseases they can develop, if not taken care of their health with the change of lifestyle at the earlier stage.

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