Abstract

Context: Hypertension is an emerging public health problem due to its high prevalence and association with cardiovascular and overall morbidity and mortality. Police personnel constitute a special occupational group with exposure to violence and stress at work, which affects their health directly and indirectly. Methodology: A cross-sectional study was conducted to find out the prevalence of hypertension and its relation with respect to police duty profile along with other risk factors among the police personnel of the Gwalior district stationed at various police stations. Results: In total, 402 police personnel were included in the study. Forty (14.7%) participants reported that they had a history of hypertension, while 26 (9.5%) reported that they were diagnosed as hypertensive in recent 1–2 months. As per the findings of our study, 273 (67.91%) participants came out to be hypertensive; among them, 207 (75.8%) were diagnosed in the current study. With increase in hierarchy, more police personnel suffered with hypertension. Conclusions: Long duty hours, higher rank, prolonged service duration, and inappropriate eating habits are the significant factors for the high prevalence of hypertension in police personnel.

Introduction

As per a WHO report, in Southeast Asia, one in three adults is hypertensive, claiming 1.5 million lives each year.[1] The prevalence of hypertension in India has been continuously increasing, from 5% in the 1960s to around 30% till 2008.[1] The number of people aged 30–79 years with hypertension doubled from 1990 to 2019, from 331 (95% credible interval: 306–359) million women and 317 (292–344) million men in 1990 to 626 (584–668) million women and 652 (604–698) million men in 2019, despite stable global age-standardized prevalence.[2]

Hypertension, if left untreated, is an independent risk factor for myocardial infarction, chronic kidney disease, ischemic and hemorrhagic stroke, heart failure, and premature death.[3]

Sudden bursts of stressful and potentially life-threatening activities in the context of long stretches of sedentary activity might produce adrenergic surge and higher demand for the cardiovascular system.[4,5] Studies have shown that long duty hours and night shifts had an increased risk of cardiovascular disease, with higher rates of smoking, alcohol/drug abuse, high blood pressure, diabetes, higher triglyceride level, and physical inactivity with difficulty in sleep.[6] With extended duty hours and frequent night shifts, police personnel are continuously exposed to higher levels of blood pressure as catecholamine are continuously secreted.[7]

No studies have been done on police personnel of the Gwalior district to find out the prevalence of high blood pressure and contributory risk factor assessment. Thus, the present study was conducted to find out the prevalence of hypertension and associated risk factors among police personnel in the Gwalior district.

Keywords: Duty, hypertension, patrolling, police, stress

Prevalence and Risk Factors of Hypertension among Police Personnel of District Gwalior- A Cross Sectional Study

Vikrant S. Chauhan, Manoj Bansal1, Vikash Sharma2, Rajesh Gupta3
Medical Officer, District Hospital Damoh, 1Department of Community Medicine, GR Medical College Gwalior, 2Department of Community Medicine, Government Medical College, Ratlam, 3District Health Officer, Shivpuri, Madhya Pradesh, India

How to cite this article: Chauhan VS, Bansal M, Sharma V, Gupta R. Prevalence and risk factors of hypertension among police personnel of district Gwalior- A cross sectional study. Indian J Community Med 2022;47:379-85.

Received: 26-08-21, Accepted: 28-02-22, Published: 10-10-22

© 2022 Indian Journal of Community Medicine | Published by Wolters Kluwer - Medknow
METHODOLOGY

We conducted a cross-sectional study to find out the prevalence of hypertension and associated risk factors among the police personnel stationed at various police stations of the Gwalior district.

By reviewing various studies, the prevalence (P) of hypertension among police personnel was found to be 35%–42%. To calculate the appropriate sample size for the morbidity profile among police personnel, we had taken the upper limit of prevalence among them (42%).[9]

By considering this, a 12% allowable error of P, and 95% confidence interval, the sample size was taken as N = 4PQ/L². The minimum sample size required for the study was 389, rounded off to 400 police personnel. All police personnel who wanted to participate in the study and were working for more than 1 year were included in the study.

Permission was granted by the institutional ethical committee prior to conducting the study. The Superintendent of Police, District Gwalior was contacted and the motive of the study was explained, and approval was received for conducting the study. On visiting the police station, the officer-in-charge was contacted for help and support to carry out the study. Written informed consents from all the participating police personnel were taken.

Anthropometric measurements and clinical examinations were done to assess waist circumference (cm), height (cm), weight (kg), body mass index (BMI), and blood pressure (BP) (mm Hg).[9] A mercury sphygmomanometer was used to measure the blood pressure of each participant. We advised all the participants to sit for a while and fill out the form first. We gave 15–20 min before measuring the blood pressure. BMI was calculated using Asian Classification of BMI.[10] The Perceived Stress Scale (PSS) is a 10-item questionnaire with five options (0–4) to choose from, which include 0 - never, 1 - almost never, 2 - sometimes, 3 - fairly often, and 4 - very often. To calculate the score, we had to reverse the scores for questions 4, 5, 7, and 8. On these four questions, scores was changed as follows: 0 = 4, 1 = 3, 2 = 2, 3 = 1, and 4 = 0. A score of 0–13 represented low stress; 14–26 was moderate stress, and 27–40 was high level of stress.[10]

Statistical analysis was performed using SPSS software, version 16.0. A simple frequency format was used for categorical variables. Standard deviation was applied wherever needed. Logistic regression analysis was used to describe the possible association between independent variables and the outcome variable as hypertension. At the start, all the variables were included in the regression model; later, less significant variables were excluded one by one.

RESULTS

In total, 402 police personnel were included in the study. The result reveals that 273 (67.9%) participants were hypertensive; among them, those who were diagnosed in the current study were 207 (75.8%). The mean systolic blood pressure of the participants was 126 mm Hg and 80 mm Hg for diastolic BP.

Participants had a mean age of 42.6 years (SD: 11.7). With the advancement of age, the prevalence of HTN also increased. The statistically significant sociodemographic variables and service profiles are shown in Tables 1 and 2, respectively. We had 377 (93.8%) male police personnel; among them, 259 (68.7%) turned out to be hypertensive, while it was 14 (56.0%) for female participants.

The mean BMI of male participants was 25.3 kg/m² (SD: 3.2), while it was 23.8 kg/m² (SD: 3.2) for female participants, which comes in the category of Obesity class I for male and overweight for female participants, respectively. Further, 31 (8.2%) male participants had BMI >25 kg/m²; among them, 10 (32.2%) were in stage 1 HTN and 15 (48.4%) were in stage 2+ HTN. Eight (32.0%) female participants were overweight; among them, three (37.5%) and three (37.5%) had stage 1 and stage 2+ hypertension, respectively. This suggests that with the increase in BMI and waist circumference, the prevalence of hypertension also increased. Further, 252 (68.7%) participants were married and hypertensive. The majority of the participants (163, 40.5%) were graduate-level educated. The mean duration of service was 19.3 years (SD: 11.8), while the current posting had a mean duration of 2.3 years (SD: 1.8) for the study participants. With the increase in the hierarchy in the department, the prevalence of hypertension also increased. The majority of the participants (358, 89.1%) were in the category of moderate level stress score.

The eating and personal habits of police personnel and their association with hypertension can be seen in Tables 3 and 4, respectively.

A multivariate logistic regression analysis was performed by taking into consideration all the significant variables. The impact of independent variables on the blood pressure as outcome variables in the final regression model is significant with P < 0.05 and Chi-square of 190.45 for the final model, which means that the model is fit for the outcome variables as hypertension. In the goodness of fit model, both Pearson and Deviance are not significant with Chi-square of 913.79 and 746.17 and P values of 0.449 and 0.99, respectively, which suggests that the model is a good fit with independent variables and outcome variable as hypertension.

Pseudo R square in Cox and Snell mode and Nagelkerke’s model explains that 37.7%–40.9% of variance that is observed in the outcome variables as hypertension can be explained by the independent variables.

For service duration, which is significant with P < 0.05, for each unit increase in service duration (for less than 5 years), the log odds of having elevated blood pressure (relative

---

Chauhan, et al.: Hypertension and police personnel
Table 1: Distribution of police personnel according to their sociodemographic variables, and anthropometric measurements in context to hypertension with proportions and bivariate analysis. (n=402)

| Variables                                                                 | Blood Pressure level (Hypertension) | Statistics |
|---------------------------------------------------------------------------|-------------------------------------|------------|
|                                                                           | Normal (23.34%)                     |            |
|                                                                           | Elevated (7.9)                      |            |
|                                                                           | Stage I (37.7)                      |            |
|                                                                           | Stage II and above (31%)            |            |
| Gender                                                                    | Male (377)                          |            |
|                                                                           | Female (25)                         |            |
| Age range in years                                                        | ≤30 (99)                            |            |
|                                                                           | 31-40 (73)                          |            |
|                                                                           | 41-50 (94)                          |            |
|                                                                           | ≥50 (136)                           |            |
| Location                                                                  | Urban (202)                         |            |
|                                                                           | Rural (200)                         |            |
| Socio-economic Status (Modified BG Prasad)                                | Upper (218)                         |            |
|                                                                           | Upper middle (154)                  |            |
|                                                                           | Middle (28)                         |            |
|                                                                           | Lower middle (2)                    |            |
| Body Mass Index (Kg/m²)                                                   | Underweight (7)                     |            |
|                                                                           | Normal (91)                         |            |
|                                                                           | Pre-obese (95)                      |            |
|                                                                           | Obese I (177)                       |            |
|                                                                           | Obese II (32)                       |            |
| Waist Circumference (cm)                                                  | Male <90 (221)                      |            |
|                                                                           | Female <80 (6)                      |            |
|                                                                           | Male ≥90 (156)                      |            |
|                                                                           | Female ≥80 (19)                     |            |
| Years of services                                                        | <5 years (46)                       |            |
|                                                                           | 5-10 years (95)                     |            |
|                                                                           | 11-15 years (27)                    |            |
|                                                                           | 16-20 years (32)                    |            |
|                                                                           | >20 years (202)                     |            |
| Present Service Rank                                                      | Constable (261)                     |            |
|                                                                           | Head Constable (64)                 |            |
|                                                                           | ASI/SI (70)                         |            |
|                                                                           | Inspector and above (7)             |            |
| Duty hours per day                                                       | ≤10 (54)                            |            |
|                                                                           | 11-15 (175)                         |            |
|                                                                           | >15 (173)                           |            |
| Any kind of patrolling duty                                               | No (114)                            |            |
|                                                                           | Yes (288)                           |            |

Table 2: Distribution of police personnel according to their service profile variables in context to hypertension with proportions and bivariate analysis. (n=402)

| Variables                                          | Blood Pressure level (Hypertension) | Statistics |
|----------------------------------------------------|-------------------------------------|------------|
| Years of services                                  | Normal                             |            |
|                                                   | Elevated                           |            |
|                                                   | Stage I                            |            |
|                                                   | Stage II and above                 |            |
| Present Service Rank                               | Constable (261)                    |            |
|                                                   | Head Constable (64)                |            |
|                                                   | ASI/SI (70)                        |            |
|                                                   | Inspector and above (7)            |            |
| Duty hours per day                                 | ≤10 (54)                           |            |
|                                                   | 11-15 (175)                        |            |
|                                                   | >15 (173)                          |            |
| Any kind of patrolling duty                        | No (114)                           |            |
|                                                   | Yes (288)                          |            |
Chauhan, et al.: Hypertension and police personnel

Indian Journal of Community Medicine ¦ Volume 47 ¦ Issue 3 ¦ July-September 2022

382

The total number of participants who are hypertensive is 273 (67.9%). As per the study by Rathi et al.[12] among police head constables in Delhi, 23.5% were found to be pre-hypertensive while 63.6% had been suffering from stage I hypertension. Ganesh et al.[13] in urban Puducherry found pre-hypertension in 37.8% of the participants and hypertension in 34.5%. Almost similar results were reported by Mahajan et al.[14] and Almale et al.[8] The high prevalence of hypertension might be due to the low cut-off used to categorize blood pressure in our study as per the latest criteria set by AHA 2018.

**Table 4: Distribution of police personnel with respect to contributory factors in context to hypertension with proportions and bivariate analysis. (n=402)**

| Personal Habits | Blood pressure level (Hypertension) |
|----------------|-------------------------------------|
|                | Normal | Elevated | Stage I | Stage II/above | Analysis |
| Physical activity (in minutes) | | | | | |
| No (184) | 50 (27.2%) | 12 (6.5%) | 72 (39.1%) | 50 (27.1%) | $\chi^2=12.91, P=0.37$ |
| <30 (79) | 19 (24.1%) | 5 (6.3%) | 31 (39.2%) | 24 (30.4%) |
| 30-60 (83) | 20 (24.1%) | 6 (7.2%) | 26 (31.3%) | 31 (37.3%) |
| >60 (56) | 8 (14.3%) | 9 (16.1%) | 21 (37.5%) | 18 (32.2%) |
| Family H/O Hypertension | | | | | |
| Present (81) | 13 (16%) | 7 (8.6%) | 26 (32.1%) | 35 (43.2%) | $\chi^2=11.61, P=0.02$ |
| Absent (321) | 84 (26.2%) | 25 (7.8%) | 124 (38.6%) | 88 (27.4%) |
| Past h/o HTN | | | | | |
| Yes (40) | 0 (0%) | 0 (0%) | 17 (42.5%) | 23 (57.5%) | $\chi^2=25.08, P=0.00$ |
| No (362) | 97 (26.8%) | 32 (8.8%) | 133 (36.7%) | 100 (27.6%) |

to normal blood pressure) is predicted to increase by 4.21 units.

Those taking a vegetarian diet were 0.819 units less likely to have stage 1 hypertension as compared to those taking a non-vegetarian diet (relative to normal blood pressure).

Similarly, for age less than 30 years, the log odds of having stage 1 hypertension is predicted to decrease by 2.26 units (relative to normal blood pressure) as compared with those with more than 50 years of age.

The variables that are significant for the multinomial regression model can be seen in Table 5.
The study had 377 (93.8%) male police personnel; among them, 259 (68.7%) turned out to be hypertensive, while it was 14 (56.0%) for female participants. A study by Hartley et al.\[15\] in Buffalo, NY police department in US had found 27.1% male and 17.7% female participants with raised blood pressure. The difference might be due to the very low number of participating female police personnel in the current study. The reason for women not preferring police job might be attributed to the nature of the job such as long working hours, irregular shifts, night duty, dangerous encounters with criminals, no regular weekend off, special duty that extends duty hours, and lack of time to fulfill their roles as home makers and mothers.

The mean age of the police personnel was 42.6 years (SD: 11.7), with 136 (33.9%) aged 50 years or more. The prevalence of stage 2+ hypertension in participants was 9 (9.1%) and 62 (45.6%) in the age group <30 years to >50 years, respectively. A study by Ramakrishnan et al.\[16\] had 46% hypertensive in the >50-years age group. Similar results were reported by Ganesh et al.\[13\] and Kumar et al.\[17\] This shows that increase in age is associated with high BP.

Education-wise, 68 (41.7%) graduates and 19 (42.2%) postgraduates were in hypertension stage 1, while 11 (24.4%) postgraduates were in hypertension stage 2+. As per the study conducted by Parkash et al.\[18\] educated police personnel are less likely to be hypertensive. This shows that once hypertensive, an increase in education level helps in understanding the disease pattern to adopt a healthy lifestyle and its management in the form of better controlled blood pressure.

Findings from the current study with respect to BMI suggest that 16 (50.0%) participants were obese class 2 and stage 2 hypertensive. With the increase in waist circumference, the prevalence of stage 2 hypertension increased from 55 (24.9%) to 62 (39.7%) among male participants, while for females, it increased from 0 (0%) to 6 (31.6%). A study by Lohakpure

The reference category for Regression Model is Normal Blood Pressure
Chauhan, et al.: Hypertension and police personnel

et al.\(^{[19]}\) in Ambajogai found that 21.0% were hypertensive with BMI ≥25 kg/m\(^2\). Similarly, as per the study by Ganesh et al.\(^{[13]}\) in urban Puducherry, 58.3% were hypertensive with BMI ≥30 kg/m\(^2\). This increase in blood pressure is due to increased BMI and waist circumference, which are positive contributory factors for elevated blood pressure.

As the service duration increased to more than 20 years, 86 (42.6%) were in stage 2+ hypertension. The findings of the current study are in compliance with the study by Puri et al.\(^{[20]}\) at a metro city in central India.

Further, among 173 (43.1%) police personnel working for more than 15 hours a day, 130 (75.1%) developed hypertension in the current study. As per Makarani et al.,\(^{[21]}\) 69% were doing more than 12 hours of work per day without rest. According to Rathi et al.,\(^{[12]}\) 94% had to work more than 12 hours a day.

Results of the current study show that 358 (89.1%) participants were in moderate level stress score. Stage 1 hypertension was present in 135 (37.7%) participants, while 100 (27.9%) were in stage II hypertension. As per the study by Ganesh et al.,\(^{[13]}\) in urban Puducherry, a high level of perceived stress was present among 51% of the police personnel. Ragesh et al.\(^{[22]}\) (2017) in Calicut had 83.2% participants with moderate to high level operational stress and 82% with organizational stress. As per study by Puri et al.\(^{[20]}\) in central India, the odds of hypertension increased with stress.

Further, 156 (38.8%) participants were consuming tobacco (in either chewing or smoking form); among them, 111 (71.2%) developed hypertension. Among them 25 participants with high blood pressure was consuming tobacco for more than 35 years. Moreover, 112 (27.9%) revealed that they consumed alcohol and 89 (79.5%) developed hypertension. As per Ganesh et al.,\(^{[13]}\) in urban Puducherry, smoking was highly prevalent in 21.6% of the participants, while alcohol use was prevalent among 50.3%.

The finding from the current study suggests that participants with normal blood pressure are less in rural areas as compared to their urban counterparts. The reason might be the vast area to be covered by police personnel and uncomfortable living conditions in rural areas.

In the multinomial regression model, the odds log of having hypertension was significant with respect to service for elevated blood pressure. For every 1-unit increase in stage 1 hypertension (relative to normal blood pressure), there was a 0.91-unit decrease in blood pressure for police personnel located at urban areas, while for stage 2 hypertension, there was a 0.75-unit decrease in blood pressure. This signifies that as per the current study, urban police personnel are more protected from high blood pressure. Other variables that were significant in the regression model are age, service duration, ghee intake, and type of diet consumption with respect to stage 1 hypertension. In the case of stage 2 hypertension, the findings were significant for age and body mass index.

Public order maintenance, prevention and control of crime, timely investigation, while following the human rights regime with civil order have made policing arduous and stressful. This continuous work hampers the already susceptible internal body homeostasis, and they become more prone to disease, disability, and infirmity in the form of hypertension and its complications. We need to focus on the health profile and timely intervention on the health status of the law enforcement officers so that they can effectively continue with their duties.

**Conclusion**

As per our findings, long, unpredictable working hours, shift duty, and sudden encounters to events demanding high physical and psychological ability make the police job inherently stressful. This fact might explain the positive association of hypertension.

Regular yearly or half-yearly psychological and physical health check-ups along with weekly or fortnightly rest can be recommended for the better health outcome of law enforcement officers. Proper health education regarding risk factors for hypertension, regular physical and mental health measures to counter the stressful conditions can have a positive effect on the prevalence of hypertension and subsequent morbidity profiles among them.

**Limitations of the study:** This study needs to be replicated in other areas in tier-1 and tier-2 cities, including their rural areas, for capturing the better health status of police personnel.

**Declaration of patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

**Acknowledgements**

Special thanks to Superintendent of Police, Dr Ashish Kumar, District Gwalior for his support and providing me with all the necessary documents to carry out my research work smoothly. I would like to thank all the police personnel and police station in-charge for their consent and cooperation in collecting the required information for this research work.

**Financial support and sponsorship**

Nil.

**Conflicts of interest**

There are no conflicts of interest.

**References**

1. Anchala R, Kannuri NK, Pant H, Khan H, Franco OH, Di Angelantonio E, et al. Hypertension in India: A systematic review and meta-analysis of prevalence, awareness, and control of hypertension. J Hypertens 2014;32:1170-7.
2. NCD Risk Factor Collaboration (NCD-RisC). Worldwide trends in hypertension prevalence and progress in treatment and control from 1990 to 2019: A pooled analysis of 1201 population-representative studies with 104 million participants. Lancet 2021;398:957-80.

3. Ventura HO, Lavie CJ. Impact of comorbidities in hypertension. Curr Opin Cardiol 2016;31:374-5.

4. Mittelman MA, Maclure M, Tofler GH, Sherwood JB, Goldberg RJ, Muller JE. Triggering acute myocardial infarction by heavy physical exertion: Protection against triggering by regular exertion. N Engl J Med 1993;329:1677-83.

5. Kales SN, Tsismenakis AJ, Zhang C, Soteriades ES. Blood pressure in firefighters, police officers and other emergency responders. Am J Hypertens 2009;22:11-20.

6. Bøggild H, Knutsson A. Shift work, risk factors and cardiovascular disease. Scand J Work Environ Health 1999;25:85-99.

7. Hayashi T, Kobayashi Y, Yamaoka K, Yano E. Effect of overtime work on 24-hour ambulatory blood pressure. J Occup Environ Med 1996;38:1007-11.

8. Almale BD, Bansode gokhe SS, Suryawanshi SR, Vankudre AJV. Health profile of Mumbai police personnel: A cross sectional study. Indian J Forensic Community Med 2015;2:87-90.

9. Whelton PK, Robert MC, Wilbert SA, Donald EC, Karen JC, Himmelfarb CD, et al. Guideline for the prevention, detection, evaluation, and management of high blood pressure in adults: A report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. J Am Coll Cardiol 2018;71:e127-248.

10. WHO Expert Consultation. Appropriate body mass index for Asian populations and its implications for policy and intervention strategies. Lancet 2004;363:157–63.

11. Cohen S, Kamarck T, Mermelstein R. A global measure of perceived stress. J Health Soc Behav 1983;24:385-96.

12. Rath K, Singh K. Assessment of weight status among police head constables in Delhi. Int J Health Sci Res 2018;8:209-14.

13. Ganesh KS, Naresh AGV, Bammigatti C. Prevalence and risk factors of hypertension among male police personnel in Urban Puducherry, India. Kathmandu Univ Med J 2014;48:242-6.

14. Mahajan DC, Birari SS, Khairnar GS, Patil YP, Kadam VJ, Joshi YM. Prevalence of non-communicable diseases risk factors in two groups of urban populations. Asian J Epidemiol 2009;2:1-8.

15. Hartley TA, Burchfiel CM, Fekedulegn D, Andrew ME, Knox SS, Violanti JM. Associations between police officer stress and the metabolic syndrome. Int J Emerg Ment Health 2011;13:243–56.

16. Ramakrishnan J, Majji SM, Premarajan KC, Lakshminarayan S, Thangaraj S, Chinnakali P. High prevalence of cardiovascular risk factors among policemen in Puducherry, South India. J Cardiovasc Dis Res 2013;4:112-5.

17. Kumar N, Rana RK, Jha J, Chaudhary AK, Gupta AK, Roy C. A cross sectional observational study, to explore the prevalence of cardiovascular risk factors for heart diseases along with exploration of metabolic syndrome in personnel of an eastern district in India. IOSR J Dent Med Sci (IOSR-JDMS) 2017;16:43-9.

18. Parkash J, Kalhan M, Singhania K, Punia A, Kumar B, Kaushal P. Prevalence of hypertension and its determinants among policemen in a city of Haryana, India. Int J Appl Basic Med Res 2019;9:143-7.

19. Lohakpure VR, Vedpathak VL, Jogdand MS. Assessment of the cardiovascular risk factors among police personnel in rural area of Maharashtra. MedPulse Int J Community Med 2017;3:21-4.

20. Puri AM, Joshi PM. Hypertension among police personnel with reference to perceived stress-A cross sectional study. Occup Med Health Aff 2019;7:300.

21. Makarani MA, Bhardwaj G, Singh J, Narwal A. An exploratory study to assess the effect of air pollution on respiratory status among traffic police personnel in selected areas of Pune City. Int J Nurs Sci Pract 2016;1:9-15.

22. Ragesh G, Tharayil HM, TP Meharoof Raj, Philip M, Hamza A. Occupational stress among police personnel in India. Open J Psychiatry Allied Sci. 2017;8:148-52. doi: 10.5958/2394-2061.2017.00012.X. Epub 2017.