

INTERARM SYSTOLIC BLOOD PRESSURE DIFFERENCE IS ASSOCIATED WITH A HIGH PREVALENCE OF CARDIOVASCULAR DISEASES- A CROSS-SECTIONAL STUDY IN POLICE WORKER

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Article Info: Received 11 October 2020; Accepted 20 November 2020

DOI: <https://doi.org/10.32553/ijmbs.v4i11.1524>

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Conflict of interest: No conflict of interest.

Abstract

Background: Interarm systolic blood pressure difference more than 10 mm of Hg is predictor of cardiovascular and metabolic risk. Despite of sufficient physical activity there is high prevalence of obesity in police personal because of stressful working environment. No studies have addressed the significance of interarm pressure difference among them. Therefore, the present study conducted to access the relation of interarm blood pressure difference with obesity in police personnel.

Aims and Objective: To estimate the interarm pressure difference in police personal to see its association with their obesity.

Material and Method: This cross-sectional observational study done on 245 police workers in PAC, Sitapur, India. Subjects having more than ten years of working experience were included in study. Anthropometric measurements of subject recorded by following standard protocol. Measurement of systolic pressure in both arm recorded simultaneously by mercury sphygmomanometer. Available data analyze and expressed in percentage, mean with SD and chi square test to see the significance of association.

Results: According to anthropometric results of subjects 77.14 percent subjects were having generalised obesity and 82.04 percent of subjects having abdominal obesity. 34.29 percent of subjects showed abnormally high (≥ 10 mmHg) inter-arm systolic blood pressure difference. Both type of obesity showed positive association with blood sugar level but no association with interarm pressure difference.

Conclusion: Interarm blood pressure difference is greater in individual having obesity or prolong duration of service. Such subjects are more susceptible to develop coronary artery disease or peripheral arterial disease in future. Early screening can help to detect the vascular events likely to occur in the future

Keywords: Body mass index, Waist circumference, Interarm pressure difference, Random blood sugar

Introduction

Measurement of blood pressure is a common procedure performed in every patients attending outpatient department. Measurement of blood pressure (BP) in both arms is recommended in clinical practice.¹ The importance of measuring blood pressure in both arms is initially to prevent the misdiagnosis of hypertension due to normal differences in blood pressure between the arms. Blood pressure readings in the right and left arms that differ by a few mm of Hg are quite normal but more than 10 mm of Hg could suggest trouble and should be measured in both arm on subsequent visit.² Most of the researcher also recommended that blood pressure should be measured in both arms and the arm with the highest value should be used for subsequent measurements.^{3,4,5,6} Several prospective studies have also reported interarm difference (IAD) in blood pressure as a risk factor for future

cardiovascular events and cardiovascular death.^{7,8,9} As IAD is simple to detect/measure in clinical practice, it will be of clinical benefit for primary prevention of CVD, whether IAD can be established as a useful parameter for cardiovascular risk assessment.¹⁰ Studies confirmed that depression and anxiety also correlated with significant difference in blood pressure between the arms.¹¹ We conducted this study in police personal because police work is considered to be one of the stressful occupations. Police are at high risk of developing cardiovascular diseases due to work related stress.¹² Despite of sufficient physical activity most police worker is suffering from overweight or obesity. They frequently exposed to physical, mental and social stressors while doing their job.¹³ Moreover long working hours, irregular eating habits, sleepless nights, shift duties and disturbed personal life produces stress in the police officer's life and they

become vulnerable to obesity and other metabolic disorders.¹⁴

Aims and Objective

1. To estimate prevalence of obesity in police personal.
2. To estimate interarm pressure difference.
3. To find out relationship between obesity and interarm pressure difference.

Methodology

This cross-sectional observational study conducted on 245 police personnel working at provincial armed constabulary, Sitapur, Uttar Pradesh from October 2016 to April 2017. This study was approved by institutional ethical committee. After getting written informed permission from higher authority to conduct the study, subjects selected randomly after getting their verbal consent to participate in study and only those subjects included who have completed 10 years of services. Subjects were explained in detail the nature of study and assure the confidentiality of recorded data. Demographic data of subjects such as age, duration of service, nature of duty and food habits were recorded. Anthropometric parameters of subject was measured using standardized techniques.¹⁵ Height (in centimeters) of subject measured using a measuring scale and weight (in kilograms) was measured with a calibrated electronic weighing scale that was kept on a firm and flat surface. Body mass index (BMI) was calculated using the formula $\text{weight (kg)}/\text{height}^2 \text{ (m)}$. Waist circumference (WC) (in centimeters) was measured by non-stretchable measuring tape at the smallest horizontal girth between the costal margins and the iliac crest at the end of expiration. Blood pressure of both the arm is recorded in supine position by auscultatory method of BP measurement by mercury sphygmomanometer under standardized protocol after taking 10 min rest to the subject. Measurement has taken in the arm first presented without prompting, and the cuff was then swapped to the other arm and another measurement taken. Differences in systolic blood pressure were recoded for analysis. Blood sugar estimation of all participants also recorded by instant sugar meter after proper sterilization. Relationship between interarm pressure difference and different anthropometric measurement were investigated in linear model.

Statistical analysis

Available data secured in widespread excel data sheet and analyzed using SPSS software 16.0 version. Result was expressed as percentage and mean with standard deviation. Chi-square test was used to see the association between different variables. Association was considered statistically significant at $P < 0.005$.

Result

Sociodemographic results of study subjects showed that mean age of subjects is 40.34 (8.23). 77.14 percent of subjects were having generalised obesity with mean body mass index of 27.65 (3.99). According to waist circumference of study subjects 82.04 percent of subjects were having abdominal obesity with mean WC of 99.31 (9.11). Study result according to nature of job showed that majority (95.92%) of police personnel engaged in field or shift duty. Classification of subject according duration of service showed that majority of subjects completed 10 years of service and only 11.43 percent of subject duration of service between 21 to 30 years with mean duration of service is 23.29 (8.49); **Table 1**. 34.29 percent of study subjects showed abnormally high (≥ 10 mmHg) inter-arm systolic blood pressure difference which is indicator of cardiovascular risk and 37.55 percent of subjects shows abnormally high Random blood sugar level with mean sugar level of 158.08 mg/dl of study subjects (**Table 2**). Generalised obesity of study subjects shows high significant association (0.006) with RBS but no association with inter-arm blood pressure difference. Abdominal obesity also shows significant positive association with RBC which signifies that subject having obesity are highly prone to develop metabolic disorder (**Table 3, 4**).

Table 1: Socio demographic variables of subjects

Socio demographic variable	N	%	Mean (SD)	
Age of subject	30-40 years	135	55.1	40.34 (8.23)
	41-50 years	72	29.39	
	51-60 years	38	15.51	
Duration of service	≤ 10 years	154	62.85	23.29 (8.49)
	11-20 years	63	25.72	
	21-30 years	28	11.43	
Food habit	Veg	78	31.84	
	Non veg	167	68.16	
Nature of job	Office	10	4.08	
	Field	235	95.92	
Body mass index	Normal	32	13.06	27.65 (3.99)
	Pre Obese	24	9.8	
	Obese	189	77.14	
Waist Circumference	Normal (85-90 cm)	44	17.96	99.31 (9.11)
	Obese (> 90 cm)	201	82.04	

Table 2: Dependent variables of subjects

Dependent variables			N	%	Mean (SD)
Inter-arm difference	systolic pressure	Normal (5-10 mmHg)	161	65.71	141.32 (18.13)
		Abnormal (> 10 mmHg)	84	34.29	
RBS		Normal ≤140 mg/dl	153	62.45	158.08 (107.79)
		Abnormal >140 mg/dl	92	37.55	

Table 3: Association of body mass index with different variables of subjects

Variables		Body mass index				Chi square value / p value
		Normal	Pre Obese	Obese	Total	
Inter arm SBP Difference	Normal (5-10 mmHg)	17(10.56%)	15(9.32%)	129(80.12%)	161(100%)	2.90/0.23
	Obese (> 10 mmHg)	15(17.86%)	9(10.71%)	60(71.43%)	84(100%)	
	Obese (> 10)	3(4.92%)	7(11.48%)	51(83.61%)	61(100%)	
RBS	Normal ≤140 mg/dl	28(18.3%)	19(12.42%)	106(69.28%)	153(100%)	14.68/0.006
	Abnormal >140 mg/dl	4(4.35%)	5(5.43%)	83(90.22%)	92(100%)	

Table 4: Association of waist circumference with different variables of subjects

Variables		Waist circumference			Chi square value / p value
		Normal (85-90 cm)	Obese (> 90 cm)	Total	
Inter arm SBP Difference (Systolic)	Normal (5-10 mmHg)	42(17.87%)	193(82.13%)	235(100%)	0.03/0.98
	Obese (> 10 mmHg)	2(20%)	8(80%)	10(100%)	
RBS	Normal ≤140 mg/dl	30(19.61%)	123(80.39%)	153(100%)	0.75/0.68
	Abnormal >140 mg/dl	14(15.22%)	78(84.78%)	92(100%)	

Discussion

This is the first study to see relation of interarm pressure difference and obesity in police personal. Most of the study performed in general population and established the fact that abnormally high interarm pressure difference (≥ 10 mmHg) is associated with cardiovascular risk and metabolic disorder in future. Our study result shows high prevalence of both generalized and abdominal obesity in police personnel. High prevalence of both generalized and abdominal obesity in our study subjects may be attributable to poor levels of nutritional awareness, increased intake of fatty foods, and a low level of physical activity.¹³ It may be because our study subjects were from localised reserve police personnel and most of the police

personnel reside in battalion premises and frequently use vehicle for travel which curtails their physical activity. Most of the non officer police personnel perform rotation duty. This rotation duty of police worker affects their sleep pattern which leads to irritability, agitation and stress. Different studies confirmed high prevalence of stress in police personnel which is a major cause of obesity and high blood pressure.^{16,17} Study result showed that 34.29 percent of subjects were having systolic interarm pressure greater than 10mmHg which were abnormal and 37.55 percent of subjects were abnormally high glucose level and showed significant association but interarm pressure difference not showed association with obesity. Jaymen et al. (2016)¹⁸ conducted a study in shift work police worker and stated

that while there was a significant increase in SBP after shift work, there was no change in DBP. In a study by Shiozaki, et al. (2013)¹⁹ they found that the development of myocardial ischemia was significantly associated with known risk factors, especially with hypertension, dyslipidemia and glucose intolerance. The increase with age of the prevalence of myocardial ischemia and the increase in metabolic syndrome were greater in police officers. Irregular working conditions in shifts, prolonged working hours and inappropriate lifestyles can influence the prevalence of cardiac ischemia in police officers. This confirmed our finding as our result also showed significant association with high sugar level of study subjects. In a study conducted by White et al. (2014)²⁰ on army veterans found significant association between inter-arm BP difference of >10 mmHg and factors associated with lifestyle such as smoking, alcohol intake and obesity. Significant difference in interarm systolic pressure is established as a marker of future cardiovascular and other metabolic risk. Simultaneous measurement of blood pressure in both arm at a time is easy to perform. Verberk W et al. also stated in his study that blood pressure measurement in both arms is recommended for each patient as vital determinat of cardiovascular risk.²¹ Cao et al. (2015) reported that IAD data obtained by simultaneous BP measurement in both arms is more reliable for cardiovascular risk assessment as compared with IAD data obtained by nonsimultaneous measurements of the BP in both arms.²² Recent studies have confirmed that the interarm systolic pressure difference is closely associated with cardiovascular mortality and peripheral arterial disease.^{23, 24} Interarm systolic pressure difference is more significant than diastolic pressure difference because disturbed circadian rhythm and stress mostly affected systemic blood pressure. Different studies also confirmed that shift work may have the propensity to impede BP regulation and increase the risk of hypertension, potentially through circadian rhythm dysregulation.^{25, 26} It is vital to undertake measurements of BP in a consistent manner in both arms for all subjects, to record the findings accurately, and to record measurements taken from the 'higher arm' to guide subsequent assessments.²⁷

Conclusion

Study results showed that the interarm blood pressure difference is greater in individual having obesity or prolong duration of service. Such subjects are more susceptible to develop coronary artery disease or peripheral arterial disease in future. Screening for interarm BP difference at an initial level will help in detecting the vascular events likely to occur in the future. Routine measurement of blood pressure in all out patient should practice to measure BP in both arms should be brought into regular

practice in every healthcare setting including primary health care.

Acknowledgement

Author sincerely acknowledges the guidance and assistance of Commandant, Sitapur and appreciates effort of our technical staff for their help in data collection.

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