

## Cardio Dynamic Response to Cold Pressor Test in Traffic Policemen in Chennai City.

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**Abstract:** Traffic noise is one of the varied causative factors for stress, especially in cities like Chennai. Added to the other risks for stress, traffic policemen are victimized to this too. Blood pressure is an indicator to assess the cardiac status in stress. Increased cardiovascular reactivity to the CPT (Cold Pressor Test) helps to predict the future development of hypertension. So, the present study is aimed to assess the cardio dynamic response to cold pressor test among the traffic police personnel. This comparative study includes randomly selected 30 traffic policemen of Chennai city and 30 controls on whom the cold pressor test was performed. Traffic police personnel showed significant increase in BMI, higher resting heart rate and higher diastolic blood pressure than the controls. Systolic Blood Pressure (SBP) and Diastolic Blood Pressure (DBP) after immersion shows significantly ( $P < 0.001$ ) higher value in traffic police than the controls. Difference of SBP and DBP also shows high significance ( $P < 0.05$ ) among the policemen, but there was no such difference between the BP with regard to the duration of exposure ( $P > 0.05$ ). Traffic policemen are hyper reactive to cold pressor test compared to the controls. Hence they have to be sensitized about their risks and the need for stress management.

**Keywords:** Traffic police, cold pressor, noise stress, sympathetic reactivity.

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### I. Introduction:

Stress is a major cause for common health problems in today's world. Environmental stress caused by the traffic noise is one of the varied causative factors for stress. This is more common in fast developing cities like Chennai especially due to motorization. The traffic police men are the most affected victims for this added stress caused by noise pollution. Further, traffic police men are engaged in controlling traffic congestion particularly at heavy traffic junctions and they are at a high risk of suffering from hazards of noise and air pollution due to continuous exposure. Previous studies found that occurrence of various stress-related health outcomes like abnormal norepinephrine levels, alcoholism, atherosclerosis, myocardial infarction, hypertension are also commonly reported in policemen<sup>1-4</sup>. The blood pressure (BP) responses to environmental stressors such as acute exposure to cold could be used as one of the indicator for global sympathetic activation and to assess the cardiac status. Cold Pressor Test (CPT) is considered as a sympatho-excitatory manoeuvre among the different non-invasive techniques that are available for assessing the autonomic cardiovascular status<sup>5</sup>. Increased cardiovascular reactivity to the CPT may help to predict the future development of hypertension<sup>6,7</sup>. So the present study is aimed at assessing the cardio dynamic response to cold pressor test among the traffic police personnel.

### II. Methodology:

Institutional ethical clearance was obtained before commencement of the study. This comparative study includes randomly selected 30 male traffic policemen of Chennai city engaged in traffic control and 30 age matched controls. The cold pressor test was performed according to Hine's protocol<sup>8</sup>. After explaining the nature of the test, the participants were made to sit in a quiet room. They were asked to refrain from caffeine, alcohol, cigarette or strenuous exercise 2 hours prior to the test. A resting blood pressure reading was noted with a mercury sphygmomanometer at the beginning of the study. The arm was supported at heart level and an appropriately sized BP cuff encircling at least 80% of the upper arm was used. Each value of BP noted was the mean of at least three consecutive readings. BP was recorded by a trained investigator. Participants with blood pressure levels of less than 140/90 mm Hg were included in the study.

The subjects were then asked to immerse their right hand in cold water (4–6 °C) up to the wrist for 1 minute. At the end of 1 minute, BP was measured in the other arm and again noted at 2<sup>nd</sup>, 4<sup>th</sup> and 6<sup>th</sup> minute. The

highest of these readings was chosen as their peak blood pressure. The difference between the peak and basal blood pressures determined the level of vascular activity. Maximum increase in systolic (SBP) and diastolic pressures (DBP) during cold pressor test was calculated and rise of SBP more than 22mmHg and DBP more than 18 mmHg were considered as hyper reactors to cold pressor.

### III. Statistical Analysis:

Data was expressed as Mean±SD. Student t-test was performed for intergroup comparison and One-way Anova was used for comparison within the group. Statistical analysis was performed using R statistical software. A p value of less than 0.05 was considered statistically significant.

### IV. Result:

Table 1: Anthropometric variables of traffic police and control group.

Variables	Control	Police	P-value
Age	42.88±4.89	37.55±9.35	0.04
Height	171.72±6.56	172.83±4.17	0.54
Weight	74±8.66	83.22±6.32	0.0009
BMI	25.16±3.23	27.91±2.66	0.008

Table 2: Baseline HR and BP in Traffic Police and Control group.

Variables	Control	Police	P value
Resting Heart rate (Bpm)	73.16±4.133	83.05±10.13	0.0008
Resting SBP mmHg	127.22±6.62	132.55±11.87	0.1078
Resting DBP mmHg	74.55±4.59	85.66±11.16	0.0007
SBP after immersion mmHg	144.22±6.01	155.50±10.78	0.0006
DBP after immersion mmHg	90.77±5.57	95.88±10.92	0.0001
Difference of SBP mmHg	17.23±4.456	22.96±4.65	0.00047
Difference of DBP mmHg	16.22±3.62	20.22±6.52	0.0312

Table 3: BP variation in traffic police (based on years of exposure)

Variables	Exposure in Yrs			P-value
	<5 Yrs (2)	5-10 Yrs (15)	>10 Yrs (13)	
Difference of SBP mmHg	18.0±1.02	22.25±4.06	23.87±5.40	0.591
Difference of DBP mmHg	16.0±0.9	19.02±6.27	21.75±7.15	0.615

Table -1 shows the anthropometric characteristics of the two groups. Traffic police personnel showed significant increase in BMI than the controls. Table 2 shows that the resting heart rate and diastolic blood pressure were significantly (P<0.0001) higher in traffic police than controls. After immersion in cold water, SBP and DBP rise were more at the end of first one minute and showed significantly higher value among the police personnel. There was no such difference between the BP with regard to the duration of exposure (table 3) and may probably be due to low sample size in <5yrs group (n =2).

### V. Discussion:

The CPT is a standard test which is frequently being used as a laboratory stressor<sup>9-11</sup>. The present study was conducted to compare the blood pressure response to the cold pressor test in traffic policemen with age matched normotensive subjects. Resting HR and DBP show significant higher value when compared with normal subjects. Shafique Ahmed et al., 2011 found that the prevalence of hypertension was increased (24.44%) among the traffic personnel in Dhule city. Difference of SBP and DBP after cold immersion shows that the traffic policemen were hyper reactors to cold pressor test. Previous studies have shown that the patients with borderline hypertension show an exaggerated response to cold pressor test<sup>12,13</sup>. The CPT elicits profound activation of the sympathetic nervous system by central command and local metabolites especially adenosine<sup>14</sup>.

This sympathetic discharge triggers responses in the cardiovascular system that includes arteriolar constriction, increased heart rate and increased cardiac contractility. These are the factors responsible for the rise of blood pressure and this is known as the pressor response<sup>15</sup>. Another finding shows that overweight normotensive people have exaggerated sympathetic reactivity to cold stress<sup>16</sup>. Our results also show that traffic policemen have a mean BMI of 27.91±2.66 (overweight) with similar results. But some of the earlier studies proved that obese subjects were having blunted sympathetic responses or reactivity<sup>17-19</sup> and it may be responsible for maintaining the obese state<sup>20</sup> because energy expenditure is determined by status of the sympathetic nervous system. Obesity is not only a result from impaired sympathetic nervous activity but also from lowered activity of adrenal medulla<sup>21</sup>. With increasing weight there is a decrease in sympathetic activity and reduction in baroreflex functioning due to central sympatho inhibition<sup>22</sup>. From the above statements we clearly find that hyper reactivity in traffic policemen is not by their weight gain and hence it might be related to their job related stress. Various stress-related health outcomes such as abnormal nor-epinephrine levels,

alcoholism, heart disease were also reportedly common in police officers<sup>2,23</sup>. In addition, Sardinias et al., in his retrospective study found that police officers had significantly elevated mortality ratios for ischemic heart disease and arteriosclerotic heart diseases and it would increase with the increasing years of their employment<sup>24</sup>. Augmented sympathetic over reactivity in the stressful condition may be one of the possible mechanism underlying the increased risk of developing hypertension and cardiovascular disease in overweight individuals<sup>25,26</sup>. Hyper response to cold exposure shows over activity of sympathetic nervous system due to their work related stress. Hence further studies are warranted to address these issues more clearly.

## VI. Conclusion:

In our study we found that the cold pressor test tends to be hyper reactive in traffic policemen as compared to normal people. It clearly shows that they are in higher level of stress which in turn paves way for cardiovascular complications in future. Regular screening has to be done on them considering them as a high risk group for lifestyle disorders like hypertension and other cardiac disorders. The traffic policemen have to be sensitized about their risk and given appropriate preventive measures to manage the stress in a better way and elude the associated complications.

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