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Study of Blood Pressure and Heart Rate Variability in Office Clerks.

Narendra Gupta[1], Shashi Kant Verma[2], Sudeepa Chaudhuri[3]

[1]Assistant Professor, Department of Physiology, Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh, India.
[2]Professor, Department of Physiology, Rohilkhand Medical College, Bareilly, Uttar Pradesh, India.
[3]Professor & HOD, Department of Physiology, Rohilkhand Medical College, Bareilly, Uttar Pradesh, India.

ABSTRACT

Background: hypertension is prevalent worldwide especially in young generation is a significant.it is associated with the development of autonomic and metabolic disorders. Hypertension is often found in high stress work situations. The present study was undertaken to compare the arterial blood pressure (BP) and Heart Rate Variability (HRV) in office clerks. **Methods:** Seventy four male clerks of various offices in Bareilly, U.P., India. The age group of subjects was 21–50 years. They were divided into two groups based on their BP recordings. 21 were normotensives and 53 hypertensive. Anthropometric measurements and their BP in supine position were recorded. Deep breathing HRV test was conducted. HRV levels were compared statistically between the two groups. **Results:** The Hypertensive had significantly lesser HRV (p=0.027) compared to normotensives. **Conclusion:** Hypertensive office clerks have lower heart rate variability. Blood pressure is inversely proportional to heart rate variability.

Keywords: Hypertension, Heart rate variability, Office clerks, Work stress.

INTRODUCTION

Cardiovascular disease has become a major cause of mortality in developing nations.[1,2] According to a recent work, a good management of hypertension in India, one of the major contributors for cardiovascular diseases can lead to prevention of 300,000 of the 1.5 million annual deaths.[3] In the age group of 30-69 years, the cardiovascular mortality due to hypertension is seen more in developing nations.[1] By the year 2020, disease burden of coronary heart diseases is predicted to rise to 120% in females and 137% in males in developing countries.[4] In 2004 study on Indian burden of hypertension, the prevalence rates were 43.8% males.[5] These figures jumped to 46.3% in 2006.[3] Major contributors for hypertension in corporate Indian adults are increased work stress, strict deadlines, high expectations, soaring competition. This type of hypertensive trend in India can increase the risk of heart attack by 2 times, congestive cardiac failure by 4 times and strokes by 7 times compared to the normal population.[6] Serum cholesterol, glucose intolerance, sedentary life style, obesity may all contribute to the prognosis of the disease. Hypertension in young generation is related to work stress and sedentary life style. Sympathetic system of the body is equated with work and progress.

Name & Address of Corresponding Author
Dr. Narendra Gupta
Assistant Professor,
Department of Physiology,
Rohilkhand Medical College and Hospital,
Bareilly, Uttar Pradesh, India.
E Mail: narendra.gpt1@gmail.com

Parasympathetic system is equated with relaxation and healing. The withdrawal of parasympathetic activity and sympathetic over activity occurs in stress. A recent study by the Association chambers of commerce and Industry of India (ASSOCHAM) has mentioned that 54% of staff in software industry was suffering from hypertension, diabetes, obesity, spondylitis, depression and headaches.[7] As a complication of diabetes mellitus, autonomic neuropathy is characterized by early and widespread neuronal degeneration of small nerve fibers of both sympathetic and parasympathetic tracts.[8] When Clinical manifestations of diabetic autonomic neuropathy (DAN) supervene, then the estimated 5-year mortality is approximately 50%.[9] Parasympathetic withdrawal is seen in hypertension. Added diabetic autonomic neuropathy worsens the clinical complications. It is possible to evaluate heart rate variability by deep breathing test to assess the degree of autonomic and metabolic derailments. Botnia study has reported the prevalence of insulin resistance, obesity and altered lipid levels associated with finance, work and social relationships in a population based study of Western Finland.[10] It has been shown that work duration, work load, and mental stress have a greater impact on the functioning of cardiac[11] and autonomic nervous system.[12,13] The present study was undertaken to compare the arterial blood pressure (BP) and Heart Rate Variability (HRV).

MATERIALS AND METHODS

This work was a part of annual health checkup organized for the staff members of various office clerks including RMCH departmental clerks/computer operator, Police station clerks, HDFC bank, BSNL office in Bareilly. Study duration was October 2014 to March 2015. Seventy four male clerks in the age group of 21–50 years of a batch who participated in the camp were included in the study. Ethical Approval has been obtained for this study from the Institute's Ethical review committee. This study group was divided into control (normotensive) (n=21) and experimental (hypertensive) group (n=53) based on their BP. Their age, work experience, BMI and weight-hip ratio were recorded. General physical examination, vital signs, complete systemic examinations were done. Due to non-availability of sufficient number of hypertensive female subjects, they were not included in the present study. Hypertensive group consisted of the age group of 21-50 yrs. with BP≥ 140/90 mm of Hg or on antihypertensive medications regardless of BP. Healthy, normotensive subjects were the controls. Subjects with cardiovascular, neurological disorders, history of diabetes mellitus and any systemic illness and on drugs affecting the autonomic functions (other than the antihypertensive) were excluded from the study. A detailed history which included the work experience was taken. Subjects were weighed in clothing using a digital balance machine, which had a precision of 0.1 kg. The heights of the subjects were recorded without footwear and expressed to the nearest 0.1 cm. BMI was calculated from the height and weight as follows; BMI= weight (in kg)/height^2 (in meters). The BP was recorded in supine position (JNC 7 Criteria) in the right arm to the nearest 2mm Hg using the mercury sphygmomanometer. Two readings were taken 5 minutes apart and the mean of two was taken as the BP. For those whose BP≥ 140/90 recorded with a gap of 24 hour in between. The average of second and third was considered as the final BP. All the subjects were subjected to deep breathing test. Deep breathing heart rate variability test was conducted with the subject in a supine position, connected to the limb leads of the standard electrocardiogram. Before beginning the test, the subjects were taught to breathe at a rate of 6 respiratory cycles per minute; 5 seconds each for each inhalation and each exhalation. ECG in lead II was then recorded at a speed of 25 mm per second for one minute with the subject breathing deeply as instructed. Beginning of each inspiration and expiration was noted down on the ECG.

The R-R intervals between adjacent QRS complexes resulting from sinus node depolarization were measured manually with a scaled caliper. The R-R interval was measured in each respiratory cycle and an average R-R interval was considered for the measurement of HRV. The variability in the heart rate was calculated as the difference between the shortest and longest R-R intervals.

HRV = (1500/ shortest R-R interval) – (1500/longest R-R interval) measures in beats/ minute.

The data collected was analyzed by SPSS v21.0.0.0 64 bit edition. Statistical analysis of HRV, and anthropometric measurements were done using unpaired t test between the two groups. All tests were two-tailed and $p< 0.05$ was considered as significant.

RESULTS

There was no statistically significant change in Age, work experience, BMI and Waist:hip ratio between the two groups [Table1]. The mean BP of normo-tensive and hypertensive were 126±14.03/78±11.12 and 140±16.09/94±12.10 Hg respectively [Table 2]. In the normotensive group, the mean HRV was 35.94 ± 8.62. In hypertensive, it was found to be 32.66 ± 10.77. Statistical analysis revealed that hypertensive had significantly lower HRV than normotensives [Table 2]. (p=0.024)

Table 1: Age, Work experience BMI and Waist-hip ratio of normotensives and hypertensive subjects. (Values expressed in Mean ± SD)

Parameter	Group 1 normotensive(n=21)	Group 2 hypertensive (n=53)
Age in year	27.56±5.24	28.43 ±6.34
Work experience	3.45 ± 2.33	2.65 ± 2.22
BMI	25.57 ± 3.64	24.23 ± 3.07
Waist hip ratio	0.89 ± 0.05	0.89 ± 0.05
SBP	126±14.03	140±16.09

Table 2: Mean± SD of BP, HRV between the two groups

Parameters	Group 1 normotensive	Group 2 hypertensive
SBP	124±16.03	35.94 ± 08.62
DBP	78±11.12	94±12.10
HRV breathing test (Beats/min)	35.94 ± 08.62	32.66 ± 10.77

DISCUSSION

In this study, even with the comparable anthropometric parameters such as age, work experience, BMI and waist-hip ratio; the hypertensive group had significantly less HRV compared to that of the normotensive subjects. Clerks working in high stressed jobs tend to develop early hypertension. It has been reported that, in newly diagnosed hypertensive Clerks the arterial BP seems to be higher and diastolic BP is related to the age of the individual.[14] HRV was more constant in hypertensive group than the normotensive group. Autonomic dysfunction involves hypoactive parasympathetic system and hyperactive sympathetic system. Progression of this status for a longer duration can lead to early aging and diseases. Hence autonomic derailment can result in increased morbidity and mortality.[15] Huikuri HV et al., showed that HRV was reduced in randomly selected treated 168 hypertensive subjects compared to age matched 188 normotensive subjects.[16,17] Untreated hypertensive revealed that, the increased blood pressure is associated with decreased HRV and without any direct effects of life style factors on heart rate variability.[18] There is autonomic nervous system dysfunction. Increased blood pressure is associated with sympathetic over activity and parasympathetic withdrawal.

Patients with hypertension have a blunted sensitivity of baroreflex control of heart period. In them, baroreflex sensitivity is positively related to heart rate variability and inversely related to blood pressure variability. There exists an inverse relation between baroreflex sensitivity and mean arterial pressure.[19] There was a reduction in high frequency component of HRV and an increase in the low to high frequency ratio in stress situation compared to the control session.[20] In artificially induced stress by Stroop word colour conflict test, spectral analysis components were markedly higher before, during and after this test.[21] These observations confirm the findings of our study. In hypertensive, increased cardiac β adrenergic[22] and α vascular adrenergic[23] drive have been documented by selective receptor blockade. This can also be confirmed by measurements of plasma epinephrine levels which tend to be at a higher range in young hypertensive subjects.[24] A high sympathetic tone in hypertension has also been inferred from spectral analysis of heart rate period variability.[25]

With all these reports, it could be established that an increased sympathetic drive may be the reason for hypertension. Para sympathetic withdrawal and sympathetic over activity are related to the work stress has a major impact on the autonomic, cardiac and metabolic parameters. These derailments are due to sympathetic over activity which could be due to work related stress by infusions of epinephrine to normal decreased and chronic induced activation of hypothalamo-adrenal axis. Thus, this study indicates that hypertension and HRV need to be monitored periodically in order to prevent the early onset of cardio-metabolic disorders in stress situation workers.

CONCLUSION

Hypertensive office clerks have lower heart rate variability. Blood pressure is inversely proportional to heart rate variability.

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