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Seasonal Variation In Blood Pressure In Hypertensive Patients, In Kolkata, India?

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Abstract

Aim: : To evaluate the causes of increased incidence of strokes in winter as compared to summer in the city of Kolkata, India
Protocol: 25 hypertensive middle aged patients, attending the Medical OPD were selected randomly for the study. Keeping there blood pressure under control with suitable therapy, Arterial BP readings were recorded monthly for 12 consecutive months.
Results Mean Arterial BP (Systolic) of the patients was 134.12 mm.Hg.±1.86 in summer and 149.24 mm. Hg.±2.17 in winter. The Mean Arterial Blood Pressure (Diastolic) was 83.40 mm. Hg.±0.88 in summer and 88.76 mm. Hg.±1.10 in winter. Both the differences were statistically significant. Overweight patients (BMI>25) showed almost similar seasonal variation in BP when compared with the standard weight patients (BMI up to 25)
Conclusion: Blood Pressure level is greatly influenced by the environmental temperature generally irrespective of the body weight. This fact should be considered in the management of hypertensive patients in a long follow up period.
Keywords: Seasonal Variation, Blood Pressure, Hypertensive

Introduction

Higher blood pressure in winter is documented in healthy [1] and hypertensive adults. It may potentially contribute to the observed excess cardiovascular mortality and strokes in the general population. In a General Hospital in Calcutta, the incidence of Stroke was around 42% in summer and 58% in the winter as recorded from admission data. During periods of cold weather, an increase in blood pressure variability may complicate the diagnosis and management of hypertension and may contribute to the higher cardiovascular mortality in the winter [2]. Association between an increase in the coronary heart disease occurrence and low atmospheric temperatures have been reported from mortality data and hospital admission registers [3]. The winter peak of coronary death rates and the increase in hospital admission rates for myocardial infarction in winter have been related to the effect of low temperature.4 In a further analysis of data from British Regional Heart Study, a significant association between blood pressure and both environmental temperature and humidity was found [5]. A correlation between air temperature and blood pressure has also been identified in surveys on normal school children in United States, Australia and Great Britain [6,7 8].
With all the above observations in mind, the present study has been undertaken with the following objectives:
1. To observe the effect of seasonal variation of blood pressure in hypertensive adults of Eastern Indian population, receiving anti-hypertensive drugs and maintaining a controlled status.
2. To measure the mean fluctuation of blood pressure (both systolic and diastolic) from winter to summer to evaluate any significant clinical abnormality evolving out of the fluctuation.

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Materials and Methods

Selection of subjects

We studied 25 patients (15 Males and 10 Females) with hypertension, who were treated for more than five years with anti-hypertensive regularly. The patients were middle aged of either sex and had no other disease except hypertension. Selections of the patients were made at random basis, who were attending the Medical Out-Patients' Department of the Ramakrishna Mission Seva Pratishthan, Vivekananda Institute of Medical Sciences, Kolkata.

Study Protocol

After detail clinical examination and history recording, arterial blood pressure measurement was done for each patient. The patient was asked to take rest for ten minutes and thereafter three consecutive readings of arterial blood pressure on the right or left upper limb were taken and the mean of the three readings was considered as the desired value. The patient was in sitting position while taking the blood pressure readings. The patients were then put on monthly follow up basis and in each follow up visit; same procedure was maintained for blood pressure measurement. The process was carried out in a similar manner for twelve months for all patients and then, the data obtained were analyzed.

Climatological data

Calcutta is in the eastern part of India, where the maximum and minimum temperature in summer is 38° C and 25° C and in winter it is 22°C

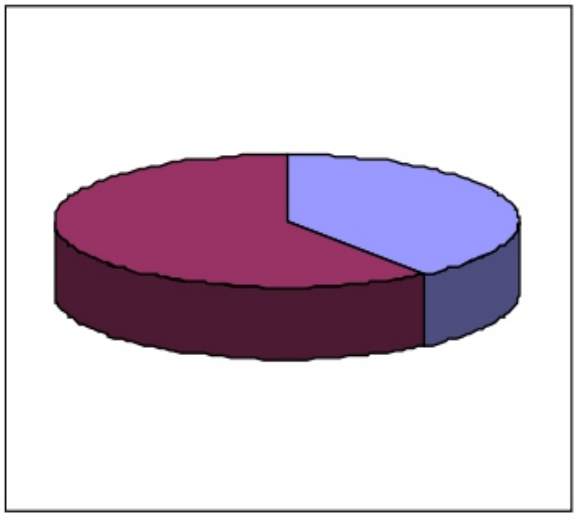

Figure 1: Male and Female Participation in the Study. The Figure Shows 60% Males & 40% Females

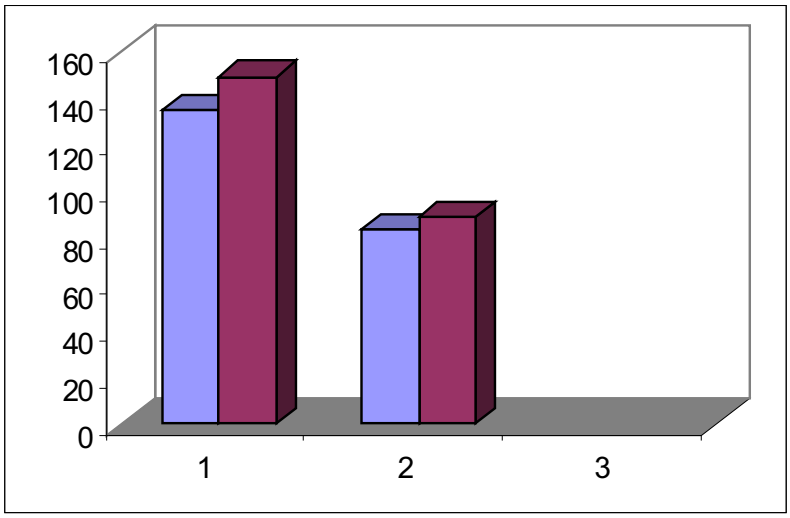

Figure 1: Bar diagram showing variations of sbp and dbp in summer & winter 1 = SBP in Summer & Winter, 2 = DBP in Summer & Winter

and 11˚ C respectively on average. Considering this data, it may be said that the average environmental temperature in summer is around 30-31˚C and in winter it is 15-16˚C. The information was obtained from the news bulletin of the local Meteorological agency.

Statistical analysis

The data were analyzed for statistical evaluation. All data were expressed as mean ± S.E. Correlations were assessed with Pearson's r value and significance between the mean values was tested by student's t-test. All tests were two-tailed and $p<0.05$ was considered as statistically significant.

Results..

All the 25 patients completed the study period of 1 year. Their blood pressures were otherwise stable except the variation due to the seasonal change. The results were expressed in Tables and [Figures 1-2]. Table 1 shows the baseline data of the patients, containing their mean age, height, weight, blood pressure, and waist/hip ratio with 95% confidence interval limits. It is clear from the table that all patients are middle aged, having standard height and weight as per Indian criteria with moderately controlled blood pressure. The findings from Table 2 clearly indicate the effect of seasonal variation on blood pressure. It is found that both the systolic and diastolic blood pressure showed significant changes according to the change in temperature. In summer, both mean systolic and diastolic blood pressure is less than those in winter and the difference is statistically significant.

A comparative study, showing the seasonal variation of BP as per BMI, has been presented in Table 3. Here, subjects having BMI upto 25 (standard weight as per Indian criteria) showed significant changes in both systolic and diastolic blood pressure compared between summer and winter. Although the subjects having BMI more than 25 showed significant change in systolic blood pressure, diastolic blood pressure showed no significant difference.

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Discussion

Mean plasma noradrenalin concentration varies significantly as per seasonal variation. In a recent study on seasonal variations in haemodynamics and blood pressure regulatory hormones, the resting catecholamines, rennin activity and aldosterone were measured and the authors found significant differences [9]. Urinary excretion of catecholamine and sodium was significantly higher in winter than in summer. The increase in BP may be due to increase in sympathetic activity in cold weather , so could be intervened by β-blockers and other sympatholytic antihypertensive drugs. The pressure effect associated with cold weather was greater in older but thinner people than younger and more obese people. In the present study, only a middle aged population was selected as study group but it was found that overweight and ideal weight subjects were affected almost equally by the temperature fluctuation except the change in Diastolic BP which was insignificant in overweight patients considering the temperature change.

The Australian study estimated that a change of 10˚C in temperature resulted in a difference in blood pressure of 5-7mm. of Hg. Kunst et.al [10] showed that the relationships between cold weather and coronary mortality were largely attributable to the direct effect of exposure to cool environment. A 10˚C decrease in temperature was correlated with a 26% increase in recurrent event rates and an 11% increase in fatal and in non-fatal event rates. A more pronounced effect was observed for older age groups for all 3 types of events. Finally, our study encouraging further study to find out a correlation between meteorological variables and coronary event rates, particularly for recurrent event rates, strongly suggest fighting against cold is important in cardiovascular prevention. The Euro-Winter group observed increase in mortality rates with decrease in temperature was higher in warmer region of Europe than in colder. This may be due to inadequate individual, as well as collective protection against cold in those countries with mild winter. Individual prevention with clothes suited to cold weather in winter and collective prevention with the improvement of heat insulation of huts in villages may

Table 1: Demographic data		
Variable	**Values**	**95% CI**
No. of patients	25	
Mean age (years)	49.4±5.3	±4.116
Mean height (m)	1.639±0.013	±0.202
Mean weight (kg)	64.4±2.019	±3.957
Mean waist/hip ratio	89.52±1.72	±3.371
Mean systolic BP (mm Hg) (SBP)	142.75±4.43	±3.978
Mean diastolic BP (DBP)	92.36±2.17	±2.038
DCI: Confidence Interval, BP: Blood pressure		

Table 2: Seasonal variation in mean blood pressure					
Variable	**Summer**	**95% CI**	**Winter**	**95% CI**	***P***
Mean SBP (mm Hg)	134.12±1.86	± 3.65	149.24 ± 2.17	± 4.25	<0.05
Mean DBP (mm Hg)	83.40 ± 0.88	± 1.72	88.76 ± 1.10	± 2.15	<0.05
DBP: Diastolic blood pressure, SBP: Systolic blood pressure, CI: Confidence Interval					

Table 3: Seasonal variation in mean blood pressure as per BMI					
Variable	**Summer**	**95% CI**	**Winter**	**95% CI**	***P***
Systolic blood pressure					
BMI upto 25	132.23±2.13	±4.17	144.38±3.15	±6.17	<0.05 (S)
BMI over 25	132.61±5.85	±11.46	150.0±4.14	±8.12	<0.05 (S)
Diastolic blood pressure					
BMI upto 25	82.08±1.44	±2.82	86.09±1.50	±2.94	<0.05 (S)
BMI over 25	85.71±2.77	±5.43	91.71±1.39	±2.73	>0.05 (NS)

reduce the variation of BP in our country. As well as, proper blood pressure checking at frequent intervals and upward adjustment of antihypertensive may reduce many strokes and cardiovascular events. Another interesting outcome of the present study is that seasonal variation of BP is maintained in normal weight individuals but blunted in overweight individuals probably due to autonomic nervous system involvement, which is a known cause of cardiac arrhythmias and cardiovascular mortality in obese people. This observation of the present study also needs further study.

Conclusion

From the present study we could conclude that seasonal variation of blood pressure should be given proper attention, in management of hypertensive patients. Not only adjustment of antihypertensive drugs but also proper heating systems and adequate clothing to counter the cold waves could prevent many strokes and acute coronary syndromes.

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