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Cardiovascular Reactivity Accompanying Voluntary Urine Retention in Normal Young Adults

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Abstract

Background: The purpose of the present study was to observe the effect of urinary bladder distension on cardiovascular reactivity in normal young adults

Method: Study was conducted in T.M.U Moradabad .Blood pressure and heart rate were recorded in 30 normal healthy young adults of 18-25 years of age group. Parameters were recorded in three stages (phase 1: empty bladder before drinking water, phase 2: after intake of water and with full urinary bladder, phase 3: immediately after emptying of bladder.

Results: Significant variation (<0.001) in BP and pulse rate in different phases were observed. Systolic BP and diastolic were in First stage 112.2 ± 5.54, 76.73 ± 4.50 Second stage 134.2 ± 4.12, 92.6 ± 3and Third stage 106.6 ± 4.58, 74.4 ± 4.279 respectively . Pulse rates were 70.2 ± 3.07 , 78 ± 3.64 , 71.8 ± 2.8935 in first , second and third stages respectively and differences were significant(p <0.001).Conclusion: Findings suggested that systolic and diastolic blood pressure were raised with full urinary bladder.

Conclusion: Subjects should be asked to empty bladder before measuring their blood pressure in practice to avoid erroneous recordings.

Keywords: *Young adults, Blood pressure, Hypertension, Heart rate*

Introduction

Blood pressure & heart rate are the markers for cardiac activity. Any change in blood pressure or heart rate shows the reaction of heart to any condition or stress and these vary in different subjects against the same stress either physical or mental. Subjects showing marked variation in blood pressure & heart rates are always susceptible for cardiovascular morbidity and magnitude of cardiovascular reactivity may distinguish those prone to develop cardiovascular disease [1]

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It has been postulated that in very early hypertension the peripheral resistance is not raised and the elevation of the blood pressure is caused by a raised cardiac output, which is related to sympathetic over activity. The subsequent rise in peripheral arteriolar resistance might therefore develop in a compensatory manner to prevent the raised pressure being transmitted to the capillary bed where it would substantially affect cell homeostasis[2].

In patients suffering from urinary syncope, straining to increase the flow of urine leads to stimulation of the vagus nerve, causing bradycardia and drop in blood pressure [3]

Scultety et al observed that elevated BPs was documented in ten healthy volunteers aged 21 to 56 years when their full bladders[4]. In study done by Szasz and Whyte, rise in diastolic and systolic blood pressure was reported after bladder distension in seven normal volunteers, and four patients[5]. It appears that the

distension of bladder might be a factor of recording of elevated BP and should be taken in consideration while measuring BP .

The American Heart Association 2017 guidelines for BP measurement state to have the patient relax, sitting in a chair (feet on floor, back supported) for >5 min and to make sure the patient avoids caffeine, exercise, and smoking for at least 30 min before the measurement but there is no any specific guideline about bladder distension.

This cross-sectional descriptive study was done to know the effect of voluntary acute urine retention on the cardiovascular reactivity in normal young adults.

Material and Method

1. Participants

Male and female (30) students of 18-25 years age group of T.M.U Moradabad volunteered for this descriptive cross sectional study. Subjects who were non-smokers and non- alcoholics and with Body mass index (BMI) between 17.0-23.0 kg/m^2 were included. Subjects with chronic or acute illness at the time of study, any medication , resting pulse rate more than 90 beats per minute, resting blood pressure lower than 100/60mmHg or higher than 140/90mmHg or history of fainting fits or orthostatic hypotension were excluded.

2. Measurements:

First stage: After explaining the study and taking their consent basal parameters like age, sex, height, and weight were recorded. Resting pulse rate and blood pressure were recorded after the participants seated relaxed and comfortably in chair chair be for at least 5 minutes, with his arm bared and well supported at heart level and their backs supported following recommendations of JNC VII in a quiet room maintained at 25-27^{0}C when the subject had not yet emptied the bladder and was also not feeling the micturition urge. Blood pressure (Systolic and Diastolic) was measured by auscultatory method with Sphygmomanometer (Nova Phone Pvt.Ltd) and Stethoscope (Microtone Pvt. Ltd) and Pulse was noted from radial pulse with the help of stop watch.

Second stage: Subjects were asked to drink 500ml of water and allowed to wait till she/he felt the first micturition urge. Pulse rate and blood pressure were recorded at this time. When the subject decided to stop tolerating the micturition urge, the blood pressure and pulse rate were recorded before allowing the subject to empty the bladder

Third stage: The final recording of pulse rate and blood pressure was made just after the micturition.

3. Statistical analysis:

Cardiovascular reactivity to voluntary acute urine retention were obtained by comparing the resting values of pulse rate and blood pressure with the values obtained just before micturition, using Student's t-test to determine if micturition urge is accompanied by changes in heart rate and blood pressure.

Observation and Results

Table 1 : Mean Difference in Systolic and Diastolic Blood Pressure between stage 1 and stage 2

Parameters	N0.	SBP (Satge 1)	SBP (Stage 2)	P value	DBP (stage 1)	DBP (stage2)	P value
Mean	30	112.2	134.2	<0.0001	76.73	92.6	<0.0001
SD	30	5.54	4.12		4.50	3.28	

Mean Systolic and Diastolic Blood Pressure (SBP :First stage 112.2 ± 5.54 and Second stage 134.2 ± 4.12 , DBP : first stage 76.73 ± 4.50 and Second stage 92.6 ± 3.28) were compared and found statistically significant (Degree of freedom: 29, Two tailed p value: <0.0001 , 95% confidence intervals)

Table 2 : Mean Difference in Systolic and Diastolic Blood Pressure between stage 2 and stage 3

Parameters	N0.	SBP (Stage.2)	SBP (Stage 3)	P value	Diastolic (stage 2)	Diastolic (stage 3)	P value
Mean	30	134.2	106.6	<0.0001	92.6	74.4	<0.0001
SD	30	4.12	4.58		3.28	4.27	

Values of Systolic and Diastolic Blood Pressure of Second (SBP mean 134.2 ± 4.126 mmHg, DBP 92.6 ± 3.2863)and Third stage (SBP 106.6 ± 4.5833 mmHg DBP 74.4 ± 4.279were compared and difference was statistically significant (Degree of freedom: 29, Two tailed p value: <0.0001 95% confidence intervals).

Table 3 : Mean Difference in Pulse rate in three stages

Parameters	Numbers	Pulse			P value
		Stage 1	Stage 2	Stage 3	
Mean	30	70.2	78.0	71.8	<0.0001
SD	30	3.07	3.64	2.89	

Mean of Pulse rate between First stage (70.2 ± 3.07) , Second stage (78 ± 3.64) and third stage (71.8 ± 2.89) were also significantly different (Degree of freedom: 29,Two tailed p value: <0.0001, 95% confidence intervals).

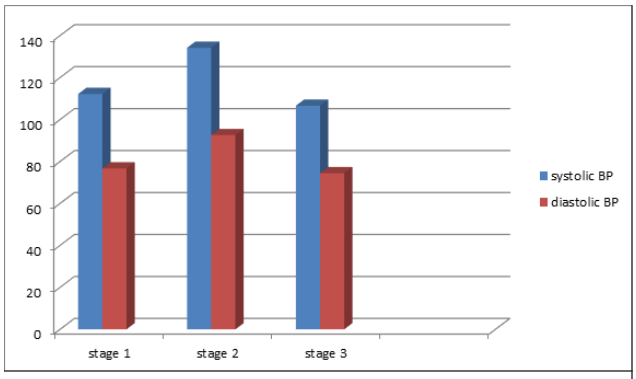

Figure 1: Changes in Systolic and Diastolic Blood Pressure

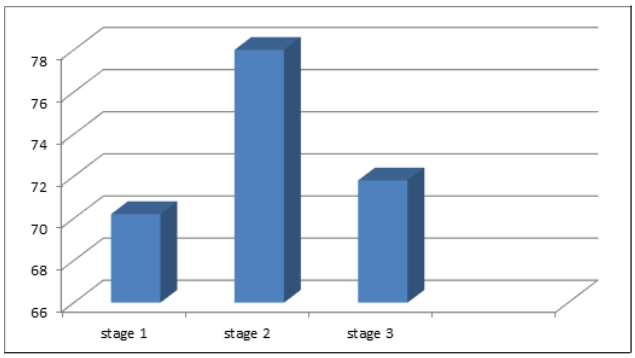

Figure 2 : Changes in pulse rate

Discussion

Measurement of blood pressure to diagnose hypertension is a important procedure done routinely as Hypertension is an important risk factor for development of coronary artery diseases and cerebrovascular accidents. There is rapid increase in incidence and prevalence of hypertension in India.

There are guidelines regarding measurement of blood pressure stating that subject should sitting on a chair with a back and arm should be placed on the same level as heart while BP is measured [6]. Factors affecting BP are caffeine, exercise, and smoking, alcohol , and must be avoided for at least 30 minutes before measurement. Variations are also seen with respiration, emotions, meals, temperature, bladder distension, pain. Bladder distension is also implicated as a factor to influence BP measurement [7,8].

In this study the changes of cardiac parameters and pulse caused by voluntary urine retention in the normal young adults were recorded. There was significant rise in systolic and diastolic blood pressure on holding urine similar to findings in study conducted by Jan

Fagius et al [9]. These changes in BP were accompanied by significantly raised heart rate in same subjects .

Post voiding there was significant decrease in heart rate , systolic and diastolic blood pressure which correlated with study by T Uchiyama et al[10].

Previous studies have suggested bladder distension is associated with various cardiovascular vasoactive hormones responses [9, 11, 12]. Findings regarding blood pressure and heart rate in this study were similar .

In this study impact of extent of bladder distension , duration of urine holding were not correlated with changes in parameters . Various mechanisms like rennin angiotensin has been proposed .Significant correlation between arterial blood pressure and plasma rennin in patients of chronic bladder distension has been observed by Funke et al [13]. In humans there seems to be a vesicovascular mechanism through which bladder distension causes sympathetic activity to contribute to elevation of blood pressure.

These mechanism can be possible explanation for changes observed in this study . White coat effect also could be a contributing factor in changes of blood pressure .

Conclusion and Recommendation

Along with other factors affecting blood pressure such as exercise, emotions etc urinary bladder distension must be included before measurement of BP. Subjects should always be instructed to empty the bladder before having measured their blood pressures to avoid erroneous diagnosis of hypertension.

Patient of retention of urine which could be due to prostate enlargement, stricture of urethra etc might have significant increase in blood pressure as well as in heart rate on long term and could cause hypertension and other cardiac complications.

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Conflict of Interest Statement: We certify that there is no conflict of interest.

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Ethical Clearance: The study was approved by ethical committee of Teerthanker Mahaveer Medical College & Research Centre Moradabad .

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