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Original Research Article

Variation of blood pressure between two arms among the young people of Guwahati, Assam, India

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ABSTRACT

Background: Aim and objective of the study was to determine whether a difference in systolic and diastolic blood pressure reading exists in between arms. To establish the mean and normal range of difference in simultaneous systolic and diastolic blood pressure measurements between the right and left arm. It is unclear to what extent inter-arm blood pressure (BP) differences may be present in younger people so that they can take precaution in relation with age.
Methods: 51 male and 51 female subjects were selected randomly in age group of 18 -20 yrs. A normal mercury sphygmomanometer was used employing Korotkoff I and V. 3 readings were taken sequentially for each arm using a standard mercury sphygmomanometer with the subject sitting after resting for 10 min.
Results: Mean ± SD inter-arm differences in Systolic blood pressure were 4.784 ± 6.338 mmHg in males and 2.314 ± 5.159 mmHg in females while Diastolic blood pressure were 3.451 ± 5.471 mmHg in males and 1.059 ± 5.112 mmHg in females.
Conclusions: The frequency of significant inter-arm systolic and diastolic blood pressure differences suggests that the blood pressure should be taken in both arms at the initial consultation. At subsequent visits, the arm in which measurements are taken should be recorded in the case notes. The higher of the two readings should be used to guide further management decisions. The accurate assessment of blood pressure (BP) is vital for the correct diagnosis and treatment of hypertension.

Keywords: Diastolic blood pressure, Female, Male, Systolic Blood pressure

INTRODUCTION

Blood pressure is defined as lateral pressure exerted by column of blood on the walls of blood vessels. It is known that blood pressure measurement is a huge topic of discussion. Many debates and methods have been proposed regarding the actual methods of BP measurements. Right brachial artery arises from axillary artery which originates from right brachiocephalic artery while Left brachial artery is a branch of left axillary artery which is a direct continuation of Aorta (Gray's anatomy 41st edition).

It was Osler in 1915 who first noted interarm blood pressure (BP) differences, and since then the question 'which arm to use for measurement has had conflicting answers. A difference in blood pressure readings between arms can be observed in various general populations, healthy women during the antenatal period, and populations with an increased risk of cardiovascular

disease, such as people with hypertension, diabetes, chronic renal disease, or peripheral vascular disease.[1-9]

Current guidelines recognize the need to check blood pressure in both arms, but this practice has not been followed by many clinicians, including general practitioners in the United Kingdom.[11-15]

The new clinical guideline for hypertension from the National Institute for Health and clinical Excellence considers an inter arm difference of less than 10 mm Hg to be normal and attributes a difference of more than 20 mm Hg to underlying vascular disease.[18] Hypertension guidelines recommend that blood pressure (BP) should be assessed in both arms at the initial visit and the arm with the higher BP is used for BP assessment at subsequent visits.

METHODS

The mercury sphygmomanometer has always been regarded as the gold standard for clinical measurement of blood pressure. The design of mercury sphygmomanometers has changed little over the past 50 years, except that modern versions are less likely to spill mercury if dropped. In principle, there is less to go wrong with mercury sphygmomanometers than with other devices, and one of the unique features is that the simplicity of the design means that there is negligible difference in the accuracy of different brands, which certainly does not apply to any other type of manometer.

Almost all have reported finding differences, but there is no clear pattern; thus, the difference does not appear to be determined by whether the subject is right- or left-handed.[19]

The circumference of the arm may not appear to be involved, to demonstrate any difference between the dominant and non-dominant arm. Explanations based on anatomical differences in the right and left arterial systems are unconvincing.

One of the largest studies was conducted in 400 subjects using simultaneous measurements with oscillometric devices, which found no systematic differences between the 2 arms, but 20% of subjects had differences of >10 mm Hg. Although these findings are disturbing, it is not clear to what extent the Differences were consistent and reproducible, as opposed to be the result of inherent blood pressure variability. Nevertheless, it is recommended that blood pressure should be checked in both arms at the first examination.

This may be helpful in detecting coarctation of the aorta and upper extremity arterial obstruction. When there is a consistent interarm difference, the arm with the higher pressure should be used.

Sample size: 102

Study design: Cross sectional study.

51 male and 51 female subjects were randomly selected in age group of 18 -20 yrs. Subject whose has family history of hypertension and diabetes are excluded from the study. Only the right handed students are included in the study. The subjects are the first year medical students. After taking permission from the Head of the Department of Physiology and written consent from the randomly selected study group blood pressure measurement was done during the practical class.

A normal mercury sphygmomanometer was used employing Korotkoff I and V sound. All the measurement was done on sitting posture. First it was done by palpatory method to get an idea of blood pressure. Then mean values were taken from the three records in each arm. Blood pressure measurement is an important topic per and the reading was collected from the practical classes of Human Physiology. The idea of selection of the subject in young age group is that-Blood pressure is not frequently examined in that particular age group, if they are known as hypertensive then it is easy for follow up.

Primary objective: To determine inter arm blood pressure difference.

Secondary objective: Gender variation in inter arm blood pressure difference.

In all the individuals, I took the consent before doing the examination. First of all, each individual was asked to sit on a chair. Sitting blood pressure was taken on the right arm by keeping the diaphragm of the stethoscope over the right cubital fossa which is flexed at the elbow and supported on a table.

Sphygmomanometer was kept at the level of heart. The individual was asked to keep their feet flat on the ground, back was supported from behind by the chair and he was asked to remain relax during the measurement. After 5 minutes same procedure was done on the left arm. Person of hypertensive family history, left handed person are excluded from the study.

RESULTS

The anonymised data were subjected to unpaired t test and two tailed P value were computed using Graph Pad Instat ver 3.05. Mean ± SD of Systolic blood pressure in male were 124.78 ± 10.67 mmHg and 120 ± 10.81 mmHg on right and left hand respectively. In female systolic blood pressure were 114.20 ± 6.14 mmHg and 111.88 ± 8.31mmHg on right and left hand respectively. While diastolic BP in male right and left hand were 82.66 ±8.46 and 79.21±8.79 respectively. Diastolic BP in female right and left hand were 75.56 ± 6.76 and 74.51± 6.47.

Mean ± SD inter-arm differences in Systolic blood pressure were 4.784 ± 6.338 mmHg in males and 2.314 ± 5.159 mmHg in females while Diastolic blood pressure were 3.451 ± 5.471 mmHg in males and 1.059 ± 5.112 mmHg in female.

Table 1: Showing systolic and diastolic BP of both ganders with 'p' value.

Parameter	P value	t	Mean difference
Systolic BP-Right a nd Left Arm (Males)	< 0.0001	5.391	4.784
Diastolic BP-Right and Left arm (Male)	<0.0001	4.505	3.451
Systolic BP-right a nd Left Arm (Female)	0.0024	3.203	2.314
Diastolic BP-Right and left arm (Females)	0.1454	1.479	1.059

Table 2: Parameters of systolic and diastolic blood pressure of both genders in both hand.

Parameter	Mean	Median	Standard error
Systolic BP-Right arm (Male)	124.78	122.00	1.495
Systolic BP-left arm (Male)	120.00	120.00	1.514
Diastolic BP-Right arm (Male)	82.66	80.00	8.463
Diastolic BP- Left Arm (Males)	79.21	80.00	8.792
Systolic BP-Right arm (Female)	114.20	112.00	0.8609
Systolic BP-Left arm (Female)	111.88	112.00	1.165
Diastolic BP-Right arm (Female)	75.56	78.00	0.9478
Diastolic BP-Left arm (Female)	74.51	74.00	0.906

Significant differences were present between the mean right and left arm systolic blood pressure [t = 5.391, P < 0.0001] for males and [t = 3.203, P = 0.0024] for females and the mean absolute difference for diastolic [t = 4.505; P < 0.0001] for male blood pressure. While significant differences were not present between the mean right and left arm diastolic blood pressure [t = 1.479, P =0.1454] for females. The differences in right and left arm systolic blood pressure was 4.78 mmHg for males and 2.31 mmHg for females and in diastolic 3.45mmHg for males and 1.05mmHg in Females for blood pressure. While differences were present between the mean right and left arm diastolic blood pressure and such minor difference is not relevant in clinical terms. The variation in mean inter-arm blood pressure was unrelated to age, ethnicity, arm circumference, handedness.

Out of 51 male subject, difference of individual systolic blood pressure between two arms found in 16 subjects (31.3%) 5 mm of Hg and individual difference of diastolic blood pressure difference found in 30 subjects (58.8%) around 3 mm of Hg. 4.784 and 3.451 are the mean difference of systolic and diastolic blood pressure in male.

Other subjects the difference is less than that. Again, in females out of 51 subject individual systolic blood pressure between two arms found in 32 subjects (64%) around 2 mm of Hg and individual diastolic blood pressure difference found in 32 subjects (64%) around 1 mm of Hg Among other subjects the difference was found to be less.

Table 3: Systolic blood pressure of both the genders in both the hands.

Gender	Right (Mean ± SD)	Left (Mean± SD)
Male	124.78 ±10.67	120.00 ± 10.81
Female	114.20 ± 6.14	111.88 ± 8.31

Table 4: Diastolic BP of both the genders in both the hands.

Gender	Right (Mean ± SD)	Left (Mean ± SD)
Male	82.66 ± 8.46	79.21±8.79
Female	75.66 ± 6.76	74.51±6.47

DISCUSSION

The measurement of blood pressure was done during the t ime of practical class in Physiology Department Measure ment of Blood Pressure is an important topic of Physiolo gy Practical. After taking permission from the Head of th e Department of Physiology and written consent from the study group measurement of Blood Pressure was done in both arms. This is important for the student because they first accustom with the blood pressure measurement and t he values, if any difference notice to them they can follo w up themselves.

Current guidance suggests that an interarm difference of l ess than 10 mm Hg can be considered to be normal and th at differences of 20/10 mm Hg or more warrant specialist referral.[16,17] Previous An interarm difference in systolic bl ood pressure of 15 mm Hg or more is associated with ang iographic evidence of carotid or aortic artery disease, and vascular disease of the arms is associated with hypertensi on.[18,19]

There are some limitations of our study. Our study group was predominantly at the age of 18-20 yrs. In future a lar ge study group will be taken and the interarm difference o f blood pressure will be seen in different posture and the l eft-handed person.

CONCLUSION

The accurate assessment of blood pressure (BP) is vital for the correct diagnosis and treatment of hypertension. This is a study by a first year medical student done among the students. The measurement of blood pressure during the time of practical examination, if any difference notice to them they can follow up themselves. Guidelines advocate the measurement of blood pressure in both arms as part of the initial assessment of hypertension.

This study supports the potential value of an inter arm difference as a simple clinical indicator of increased cardiovascular risk at an early age group. Assessment of blood pressure in both arms is recommended by guidelines and should become a core component of initial blood pressure measurement in primary care. This study adds important information to the evidence base supporting the need to detect an interarm difference in blood pressure, not only to improve measurement and management of hypertension but to consider the vascular risk to the patient.

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