

Study of Inter-arm Variation of Blood Pressure in Normal and Diabetic Individual in Out Patient Department of Nepal Medical College

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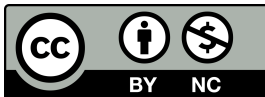
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ABSTRACT

Introduction: Growing incidence of hypertension and its significant association with diabetes mellitus are being observed in both developing and developed countries around globe. Scanty literature is available about the comparative study of inter-arm variation of blood pressure in normal individuals and diabetic among Nepalese population. This research was performed to determine extent of inter-arm variation in normal individuals and diabetics.

Methods: A descriptive observational study was carried out from 2013 January to 2014 January in a tertiary level teaching hospital of Nepal. After taking the consent and giving necessary instructions, blood pressures were measured in both the arms one after another in sitting posture using mercurial sphygmomanometer and Littman cardiosonic stethoscope. Arterial blood pressure was measured by palpatory method followed by auscultatory method. The cuff pressure at which the tap sound were first perceived was noted as systolic blood pressure (SBP). Similarly, diastolic blood pressure (DBP) was noted at the point where the sound disappeared.

Results: A total of 120 volunteers between ages of 40-80 years were studied. Highly significant inter-arm variation of both SBP and DBP was found in diabetics as compared to normal ($p < 0.01$). Highly significant inter-arm variation was found in diabetic male and female as compared to their normal counter parts ($p < 0.01$).

Conclusion: This study showed that there was significant inter-arm variation of SBP and DBP in diabetic and normal individual. So, this study encourages to measure blood pressure (BP) in both arms for proper treatment planning of an individuals.

Key words: Blood pressure; Diabetes; Inter-arm variation.

INTRODUCTION

Blood pressure (BP) means the force exerted by flowing blood against any unit area of the vessel wall.¹ The pressure in the aorta, in the brachial and other large arteries in a young adult human rises to a peak value (systolic pressure) of about 120 mm of Hg during each cardiac cycle and falls to a minimum (diastolic pressure) of about 70 mm of Hg.^{2,3} Around the globe, almost 285 million people have diabetes in 2010. Among them 90% of the patient were reported as victim of type 2 diabetes mellitus.⁴ The incidence of diabetes mellitus is increasing rapidly and by 2030, the number will be almost double.⁵ Numerous studies have reported an increased association of diabetes with different cardiovascular morbidity.⁶

HTN is a medical condition in which the blood pressure in the arteries is elevated above physiological limit. Both environmental and genetic factors may contribute

to regional and racial variation of blood pressure and HTN.⁷ Blood pressure fluctuates due to stress, emotion, temperature variation, age differences and disease like diabetes, any pathological condition involving aortic arch or upper extremities artery.⁸⁻¹⁰

In Nepal, several studies have showed growing trends of HTN, diabetes mellitus (DM) and their association. There is very high prevalence as well as sharp rise on HTN due to changing lifestyle because of socio-economic transition.¹¹ All forms of diabetes increases the risk of long term complications. These complications typically develop after many years but may be the first symptoms in those who have otherwise not received a diagnosis before that time. The major long term complication relates to damage of blood vessels. Diabetes doubles the risk of cardiovascular disease.¹²

Many studies have shown inter-arm variation of blood

pressure and guidelines recommend that BP should be measured in both arms.¹³ The reason for normal, healthy individuals having differences of BP in two arms is suggested to be anatomical differences in normal vascular supply to the arms and due to arm dominance.¹⁴ It has been suggested that innominate (brachiocephalic) artery is nearer to source of pressure and is more in direction of flow of blood from the ascending aorta, so that BP might be higher in right arm compared to left arm.¹³⁻¹⁵ Hence, our study aims to determine the difference in BP in both arms in normal as well as diabetic individual.

METHODS

This is a cross sectional study conducted in Out Patient Department of Nepal Medical College Jorpati from 2013 January to 2014 January for a period of one year. Permission for study was taken from ethical committee and after taking the consent detailed history of the diabetic patients was taken through pre designed close angled Performa. The inclusion criteria for patients were 40 years or above in age, should be newly detected case of diabetes or patient detected as diabetic for at least a year.

Patients were asked to rest quietly and comfortably in a room for five minutes before measuring blood pressure. Instructions were given to avoid stimulant beverages before half an hour of the maneuver. Three readings separated by two minutes interval were taken by the principal author and averaged. Blood pressure was assessed by both auscultatory and palpatory method.

To measure the blood pressure by an auscultatory method, Riva-Rocci cuff attached to sphygmomanometer was wrapped around the arm and inflated to obliterate the blood flow through brachial artery. Then the cuff was deflated slowly (2mm/sec). Diaphragm of the stethoscope was placed over brachial artery. At the point, when lateral pressure of blood just exceeds the cuff pressure, a tapping sound was auscultated. On further lowering the cuff pressure, a louder sound followed by a dull sound, muffled sound and finally the disappearance of sound was perceived (Korotkoff sounds). The cuff pressure at which the tap sound was first perceived was noted as SBP. Similarly, DBP was noted at the point where the sound disappeared.

RESULTS

A total of 120 subjects between the ages of 40-80 years were studied. This included diabetic and normal healthy individual among which 23 male and 37 female were diabetic and 34 male and 26 female were normal healthy individual. Among them, 60 subjects who have been diabetics for one year or who were newly diagnosed and 60 healthy age matched individuals were included. There were significant differences in SBP and DBP in right and left arm of both normal and diabetic individuals (Table 1, 2 and 3). When the blood pressures were compared between the genders amongst diabetics, there was no significant association (Table 4).

The mean right arm SBP and DBP measurements of diabetic individual were 137.6±14.59 and 85.07±8.05

Table 1: Inter-arm variation of SBP and DBP in normal healthy and diabetic persons

Blood pressure	Variable	Mean±SD (left arm)	Mean ±SD (right arm)	Inter-arm Difference Mean ± SD(mm Hg)	Level of significance
SBP	Diabetic (n=60)	135.15±11.22	137.6±14.59	7.08±4.39	p < 0.01
	Normal (n=60)	116.17±6.97	117.97±6.67	1.93±2.96	
DBP	Diabetic (n=60)	84.33±8.21	85.07±8.05	2.46±3.79	p < 0.01
		79.97±2.62	80.03±2.64	0.07±0.51	

Table 2: Inter-arm variation of SBP and DBP in male volunteers

Blood Pressure	Variable	Mean±SD (left arm)	Mean ±SD (right arm)	Inter-arm Difference Mean ± SD(mm Hg)	Level of significance
SBP	Diabetic (n=23)	138.74±8.58	142.17±11.73	6.73±3.88	p < 0.01
	Normal (n=34)	118.53±5.75	120 ±6.11	1.70±1.91	
DBP	Diabetic (n=23)	87.30±8.56	88.87±8.96	2.60±3.48	p < 0.01
	Normal (n=34)	80.53±1.79	80.59±1.81	0.06±.34	

Table 3: Inter-arm variation of SBP in female volunteers

Blood Pressure	Variable	Mean±SD (left arm)	Mean ±SD (right arm)	Inter-arm Difference Mean ± SD(mm Hg)	Level of significance
SBP	Diabetic (n=37)	132.92 ±12.16	134.76 ±15.59	7.29±4.72	p < 0.01
	Normal (n=26)	113.08±7.32	115.31 ±6.55	2.23±3.97	
DBP	Diabetic (n=37)	82.49±7.52	82.70±6.48	3.14±3.44	p < 0.01
	Normal (n=26)	79.23±3.30	79.30±3.34	0.23±0.65	

Table 4: Inter-arm variation of SBP of diabetic male and female

Blood Pressure	Variable	Mean±SD (left arm)	Mean ±SD (right arm)	Inter-arm Difference Mean ± SD(mm Hg)	Level of significance
SBP	Male (n=23)	138.74±8.58	142.17±11.73	6.73±3.88	p < 0.05
	Female (n=37)	132.92 ±12.16	134.76 ±15.59	7.29±4.71	
DBP	Male (n=23)	87.30±8.56	88.87±8.96	2.61±3.48	p < 0.05
	Female (n=37)	82.49±7.52	82.70±6.48	2.37±4.02	

while that of normal individuals SBP and DBP were 117.97±6.67 and 80.03±2.64 respectively. Similarly mean left arm SBP and DBP of diabetics were 135.15±11.22 and 84.33±8.21 and in normal SBP were 116.17±6.97 and DBP 79.97±2.62.

DISCUSSION

In Nepal several studies have been done regarding blood pressure and diabetes and its association with other clinical conditions but study about inter-arm variation of blood pressure is very scanty though literature of such study on other parts of world are available.

This study demonstrated significant mean inter-arm SBP and DBP difference in normal healthy and diabetic persons. These finding were similar to that described by Lane et al.¹⁴ There was significant mean inter-arm difference of SBP and DBP among male volunteers, study shows significant mean inter-arm difference in SBP in diabetic male. Similarly significant mean inter-arm difference in SBP and DBP were noted in female volunteer. Blood pressures were found to be higher in right arm compared to left arm as found by Cassidy and Jones.¹⁵ The present study found inter-arm variation SBP and DBP between diabetic male and female is not significant. The mean blood pressure difference in diabetic male and female is more or less similar. These results are congruent with Pesola et al.¹⁶

Several studies have measured blood pressure simultaneously, sequentially or both sequentially

and simultaneously, some of them used automated sphygmomanometer or automated devices. Other studies which used sequential blood pressure measurements as done in this study obtained inter-arm variation higher in sequential measurement as compared to simultaneous blood pressure measurement.¹⁷⁻¹⁹

CONCLUSION

This study revealed that there is significant difference in inter-arm blood pressure. Thus bilateral blood pressure measurement of an individual is essential for accurate assessment and diagnosis of health status by clinicians.

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