RESEARCH PAPER

Association between inter-arm blood pressure difference and lipid profile among undergraduate students: A cross- sectional study

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Received: 24th April, 2026; Revised: 20th May 2026; Accepted: 30th June, 2026; Available Online: 10th July, 2026

ABSTRACT

Background: Aim and objective of the study was to determine whether a difference in blood pressure reading exists in between arms and its correlation with the lipid profile. 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 differences (IAD) may be present in younger people so that they can take precaution in relation with age.

Methods: A total of 100 participants between the ages of 18 and 25 were chosen at random. A mercury sphygmomanometer was used to monitor the blood pressure and determine the lipid profile of the chosen students. A conventional mercury sphygmomanometer was used to take three consecutive readings for each arm while the subject was seated and had rested for ten minutes.

Results: In obese participants, there was a significant correlation between the inter arm blood pressure difference. Biochemical markers like Tg and cholesterol were positively correlated with BMI and the difference in blood pressure across arms in young adults, and they were significantly greater in obese individuals.

Conclusion: Both physiological and biochemical alterations are associated with elevated BMI. Vascular adaptability is adversely affected by increased adiposity in young adults.

Keywords: Tg (Triglyceride), Inter arm blood pressure differential (IABPD), Blood pressure (BP),Ttotal cholesterol (TC).

How to cite this article: Singh N, Sharma A, Prajapati S, Amir AH, Association between inter-arm blood pressure difference and lipid profile among undergraduate students: A cross- sectional study. Int J Drug Deliv Technol. 2026;16(79s):905-908. DOI: 10.25258/ijddt.16.79s.158
Source of support: Nil.
Conflict of interest: None

INTRODUCTION

The lateral Pressure that a blood column exerts on blood vessel walls is known as blood pressure. It is well known that taking blood pressure is a hotly debated subject. The actual methods of measuring blood pressure have been the subject of numerous discussions and approaches.[1] The left brachial artery is a branch of the left axillary artery, which is a direct continuation of the aorta, whereas the right brachial artery is derived from the axillary artery, which is derived from the right brachiocephalic artery (Gray's anatomy, 41st edition). Since Osler first observed inter arm variations in blood pressure (BP) in 1915, there have been different responses to the question of which arm to use for measurement. Blood pressure readings between arms can differ in a number of general populations, healthy pregnant women, and populations at higher risk for peripheral vascular disease, chronic renal illness, or cardiovascular disease. [2] Although many doctors, particularly general practitioners in the UK, have not adopted this practice, current recommendations acknowledge the necessity of checking blood pressure in both arms.[3] According to the National Institute for Health and Clinical Excellence's revised clinical guidelines for hypertension, an inter-arm difference of less than 10 mm Hg is considered normal, and a difference of more than 20 mm Hg is attributed to underlying vascular disease. According to guidelines for hypertension, blood pressure (BP) should be measured in both arms during the first appointment, and during following sessions, the arm with the higher BP should be used. [4] The difference in systolic and/or diastolic blood pressure measured between the left and right brachial arteries is referred to as the inter arm blood pressure differential (IABPD). Larger variances (≥10 mmHg or ≥15 mmHg) are becoming recognized as

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clinically significant indicators of vascular disease and cardiovascular risk, even though smaller differences (<10 mmHg) may be physiologically innocuous. Non-invasive bilateral blood pressure measurement is a simple way to get IABPD, which can identify latent vascular anomalies prior to the onset of overt disease. [5] In both populations and individuals, high blood pressure is frequently accompanied by additional cardiovascular risk factors. Dyslipidemia is the most common of these risk factors, most likely as a result of several interactions between elevated lipid levels, the onset of atherosclerosis, and endothelial dysfunction. Therefore, a deeper knowledge of the connection between dyslipidemia and hypertension may help guide how these two conditions are treated in order to prevent CVD and early mortality.

METHODS AND MATERIALS

After being made aware of the goal of the study, each participant gave written consent. The study includes those who indicated that they would like to participate. One hundred people of both sexes participated in the study. During the practical lesson, blood pressure was measured after obtaining written agreement from the randomly chosen study group. Using the Korotkoff I and V sound, a standard mercury sphygmomanometer was employed. Every measurement was taken while seated. Initially, the palpatory method was used to gauge blood pressure. The three records in each arm were then used to calculate the mean values. The reading was gathered from the practical Human Physiology classes, and blood pressure measurement is a significant issue. The biochemical test was measured using the Mindray BS-240 Pro following receipt of the subjects' written consent form. Two milliliters of baseline blood were collected. A clean disposable syringe will be used to draw venous blood, which will then be put in an EDTA vial. The lipid profile level will be measured in basic vials using a volume of 2 ml of blood (serum).

Participants: Criteria for Inclusion and Exclusion

Criteria for Inclusion:

• People between the ages of 18 and 25.

• The ability to give informed consent.

Criteria for Exclusion:

- Pre-existing metabolic and cardiovascular conditions .
- Pathologies of the thoracic aorta, including as dissection, aneurysm, coarctation, and Takayasu's arteritis.
- Terminal conditions, such as congestive heart failure, cancer, and advanced renal or liver disease.
- Unstable vital signs, such as tachycardia or hypotension.
- Not wanting to take part.

Jamovi 2.7.30 was used for statistical analysis. Every participant provided written informed permission, putting a focus on data anonymity and voluntary involvement. The investigators disclosed no conflicts of interest and offered no financial incentives.

RESULT

Table1: Distribution of gender of young adult.

	Group	N	Mean	Median	SD	SE	Minimum	Maximum
BMI	F	32	31.3	31.6	2.63	0.464	22.8	36.1
	M	68	32.1	31.8	2.73	0.331	23.2	39.6

The majority of 68% adult were male and 32% adult were female. In male subjects minimum of 23.2 and maximum of 39.6 were observed, whereas in female subjects minimum of 22.8 and maximum of 36.1 BMI was observed.

Table 2. Prevalance of significant IAD (IAD≥ 10mmHg)

IAD	n(%)
<10mmHg	29
≥10mmHg	71

A clinically meaningful inter arm blood pressure difference was present in participants.

Table 3: To investigate the Physiological changes in young adult and compare with inter arm blood pressure difference .

T-Test							
	Physiological variables		statistic	df	p	Mean difference	SE difference
IAD	BMI	Student's t	-83.2	99.0	<.001	-20.8	0.249
	Heart Rate	Student's t	-90.2	99.0	<.001	-76.9	0.852
	Pulse Pressure	Student's t	-33.2	99.0	<.001	-24.6	0.740
Note. H_a $\mu_{Measure\ 1\ -\ Measure\ 2} \neq 0$							

Table 3 shows that comparison between physiological variables in young adult with IAD. There was statistical significant difference between physiological variables like heart rate with P=0.001, pulse pressure with P=0.001, BMI with P=0.001 compared to IAD.

Table 4: To estimate the biochemical changes in young adult and compare with interarm blood pressure difference .

Paired Samples T-Test							
			statistic	df	p	Mean difference	SE difference
IAD	CHOLESTEROL	Student's t	-50.4	99.0	<.001	-210	4.17
	TG	Student's t	-30.1	99.0	<.001	-174	5.77
Note. H_a $\mu_{Measure\ 1\ -\ Measure\ 2} \neq 0$							

Table 4. Shows that comparison between biochemistry variables in young adult with inter arm blood pressure changes . There was statistical significant difference between biochemistry variables like TG with P=0.001, Cholesterol with P=0.001 with IAD.

DISCUSSION

Previous research has shown links between interarm variations and both carotid atherosclerosis and peripheral arterial disease, indicating a mechanistic connection between occlusive disease and segmental arterial stiffness.[6] However, our study's positive link with BMI as opposed to age or cholesterol levels suggests that IAD may detect a distinct vascular profile, one that is more influenced by asymmetric major artery disease than widespread intimal thickening. In this ambulatory group, diabetes and hypertension were not linked to a higher prevalence of IAD, which was unexpected. Stronger correlations between metabolic disease and inter arm asymmetry have been seen in higher-risk individuals, especially those with chronic kidney disease or long-term diabetes.[7] Method of measurement Discrepancies may also be explained by differences; our study's sequential assessments tend to underestimate genuine inter arm differences when compared to contemporaneous recordings.[8] However, the persistence of IAD in our data across a variety of subgroups indicates that it might result from structural artery differences that are not directly correlated with traditional risk factor load. The clinical implication are significant. IAD may assist in identifying patients with occult vascular disease who would otherwise go undiagnosed using conventional calculations alone because it was found across all ASCVD risk categories, including low-risk individuals. Larger interarm disparities are linked to higher risks of cardiovascular and all-cause death, according to meta-analyses.[9] Although monitoring blood pressure in both arms at the initial assessment is advised by current hypertension guidelines, this procedure is still not widely used.[10] Our results validate routine bilateral measurement as a straightforward, inexpensive supplement to cardiovascular screening that could improve risk assessment. Dyslipidemia is more common in hypertensive people, and 12% of persons with early-onset hypertension have a high prevalence of lipid disorder . Initially, excessive cholesterol causes smooth muscle cell enlargement and collagen deposition, which results in arterial stiffness and higher systolic blood pressure. Furthermore, dyslipidemia causes endothelial dysfunction and poor vasoregulation because those with high total cholesterol have lower nitric oxide production release and subsequent activity. [11]. The results of the study showed that, in comparison to people with BMI, those with elevated IAD had considerably higher levels of triglycerides (TG) and total cholesterol (TC). These changes in pre-hypertensive people's lipid profiles may raise the risk of early atherosclerosis and the ensuing development of hypertension, which indicates a increase chance of cardiovascular events. Wang R et al., Saxena et al., Jani HA et al., Chitrapu RV et al., and Sanjay M et al. had reported similar results [12]. Furthermore, a study conducted in the United States by Greenlund et al. found a connection between pre-hypertension and related risk factors like obesity and hypercholesterolemia.[13] Additionally, pre-hypertensives had a higher frequency of metabolic syndrome than people with normal blood pressure, according to a Korean study by Choi et al.[14] The findings are in line with previous research that emphasizes how dyslipidemia increases the risk of cardiovascular disease.[15] Increased triglycerides may be a factor in endothelial dysfunction and atherosclerosis, which can affect autonomic control and lower heart rate variability.

Limitations include the use of sequential rather than simultaneous blood pressure measurement, which may underestimate the prevalence of IAD, and the cross-sectional design, which prevents causal inference. Additionally, generalizability to lower-risk individuals may be limited by the clinic-based sample. To elucidate the predictive importance of IAD and its responsiveness to therapeutic intervention, further longitudinal investigations utilizing concurrent automated equipment are required.

CONCLUSION

Blood pressure should be obtained in both arms during the initial consultation, according to the frequency of significant inter-arm systolic and diastolic blood pressure discrepancies. The arm used for measurements should be included in the case notes during later visits. Future management decisions should be based on the higher of the two readings. The proper diagnosis and management of hypertension depend on the accurate measurement of blood pressure (BP). Keywords: Systolic blood pressure, female, male, diastolic blood pressure.

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