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RESEARCH
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Comparison of Blood Pressure Measurements Between the Right and Left Arms

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ABSTRACT

Evaluating blood pressure provides crucial clinical insights into cardiovascular health and systemic circulation. Variations in readings between the right and left upper limbs often arise from underlying anatomical and physiological factors. Accordingly, this research examined bilateral arterial pressure among freshman university students. This cross-sectional study employed a descriptive-comparative design involving a total sample of 54 participants. Standardized sphygmomanometry was utilized to measure bilateral readings, and the collected data were subsequently analyzed to evaluate potential inter-arm blood pressure discrepancies. Findings indicated a predominant right-arm systolic reading of 110 mmHg (40.7% of subjects), whereas the corresponding value for the left arm was recorded in 35.2% of cases. Overall, 53% of participants exhibited elevated readings in the right upper extremity relative to the left, while 46.3% demonstrated identical values in both limbs. Notably, no individual displayed lower right-arm systolic pressure compared to the left. In conclusion, although the right limb demonstrated marginally higher values than the left, measurements across all participants remained within normal physiological limits. Consequently, bilateral assessment is highly recommended to ensure maximal clinical precision.

Keywords: Blood Pressure; Systolic Blood Pressure; Inter-Arm Difference; College Students

INTRODUCTION

Blood pressure measurement is an essential clinical skill for nurses. Failure to follow the proper measurement procedures carefully may lead to inaccurate results, which can adversely affect clinical decision-making and result in inappropriate nursing interventions for patients (Susanti & Sasti, 2020). Blood pressure measurement evaluates the force exerted on arterial walls as blood circulates throughout the cardiac contraction and relaxation phases. The procedure is performed by placing a cuff around the upper arm, just above the antecubital fossa. During auscultation of the pulse, the cuff is inflated using a rubber bulb until the pulse is no longer audible, after which the cuff pressure is gradually released to obtain the systolic and diastolic blood pressure values.

When the pulse sound is first heard again, the pressure reading displayed on the sphygmomanometer scale or mercury column is documented, representing the systolic reading. Subsequently, the pressure within the cuff is gradually reduced, during which the pulse sounds become clearer before eventually weakening and disappearing. When the pulse sounds become faint and disappear, the pressure reading is recorded again and is referred to as the diastolic blood pressure.

Arterial pressure values, covering both systolic and diastolic metrics, are expressed in millimeters of mercury (mmHg). Precision in

taking these measurements remains a crucial competency for medical practitioners. As outlined in guidelines from the Seventh Joint National Committee (JNC 7), proper patient posture during evaluation requires either a seated or supine position, ensuring that both the subject's arm and the measuring device align horizontally with cardiac height (Marhaendra, Basyar, & Adrianto, 2016).

Based on recommendations issued in 2017 by the joint panel of the American Heart Association (AHA) alongside the American College of Cardiology (ACC), obtaining direct hemodynamics necessitates invasive intra-arterial monitoring. However, this method is impractical in routine clinical practice, where blood pressure is generally measured using non-invasive techniques.

Blood pressure functions to propel blood throughout the circulatory system, enabling the delivery of oxygen and nutrients to tissues and organs while facilitating the transport of metabolic waste products to excretory organs such as the kidneys and lungs. The primary function of blood pressure within the circulatory system is to ensure that all body tissues receive an adequate blood supply to meet their metabolic demands.

At the national level, the Indonesian Ministry of Health identified high blood pressure as the primary contributor to non-transmissible disease fatalities, accounting for 37% of all deaths (Indonesia Health Profile, 2022). This phenomenon highlights the need for further research on variations in blood pressure measurement, particularly among young adults who are increasingly at risk of early-onset hypertension due to stress and modern lifestyle factors.

At health science institutions such as the Diploma Three Nursing Study Program, Sidoarjo Campus, Health Polytechnic of the Ministry of Health Surabaya, students are frequently involved in practical training on vital sign assessment. Therefore, comprehending inter-limb blood pressure variations is essential to prevent clinical errors that may affect professional training. Several previous studies have investigated bilateral blood pressure discrepancies.

For example, a study conducted by Clark Christopher E. (2015) in the United Kingdom found a significant inter-arm difference (>10 mmHg) in roughly 11% of hypertensive subjects, a finding linked to an elevated risk for cardiovascular events. Similarly, a study by Essa Abdulrahman (2022) indicated that 26.1% of subjects presented a variation exceeding 10 mmHg in systolic readings between limbs.

Furthermore, previous research revealed a strong correlation between inter-limb pressure variances and the incidence of cardiovascular complications (Sharafi M., Amiri Z., Haghjoo E., Afrashteh S., Dastmamesh S., Moghaddam M., Dehghan A., & Tabibzadeh H., 2023).

Therefore, this investigation evaluated inter-arm cardiovascular variations among first-year students of the Diploma Three Nursing Study Program, Sidoarjo Campus, Health Polytechnic of the Ministry of Health Surabaya. The findings are expected to contribute theoretically to the advancement of nursing science, particularly in improving the accuracy of vital sign assessment, and to provide practical benefits for students, educational institutions, and clinical practice by enhancing precision and promoting standardized blood pressure measurement procedures.

BLOOD PRESSURE MEASUREMENT IN THE RIGHT AND LEFT ARMS

According to (Maurizio Zanetti, 2023), blood pressure can be measured using two main approaches: direct (invasive) measurement and indirect (non-invasive) measurement. Direct measurement is performed by inserting a cannula or needle into an artery to obtain continuous blood pressure readings. This method is commonly used in intensive care units or in situations requiring highly precise hemodynamic monitoring. In contrast, indirect measurement is the most commonly used method in primary healthcare

and clinical settings. It is performed using a sphygmomanometer, which operates based on either the auscultatory or oscillometric principle. This method is considered sufficiently accurate when the measurement is performed using the correct technique and validated equipment.

METHOD

A comparative, cross-sectional framework was adopted for this research. This design was used to analyze differences in bilateral upper-limb blood pressure values at one specific timeframe without longitudinal observation. Utilizing a cross-sectional methodology enables concurrent evaluation of both predictor and outcome variables (Sari & Legiran, 2024).

Data collection was carried out within the Diploma Three Nursing Department, Sidoarjo Campus, Health Polytechnic of the Ministry of Health Surabaya, East Java, in February 2026. The study population consisted of 54 first-year nursing cohort. The sampling procedure encompassed all 54 level-one nursing students satisfying the predefined inclusion and exclusion criteria; hence, a total sampling strategy was adopted.

The study variable was bilateral upper-limb systolic readings, evaluated using a manual sphygmomanometer. The measurements were recorded as the actual systolic blood pressure values (e.g., 110 mmHg and 120 mmHg). Hemodynamic assessments were conducted sequentially across both upper extremities while the participants were seated and had received adequate rest, without having engaged in running or strenuous physical activity beforehand. The measurement results were recorded on an observation sheet prepared by the researchers and were used as primary data for analysis to determine the inter-arm blood pressure variations.

Analytical procedures involved descriptive statistics to compute frequency distributions, percentages, range extremes (minimum and maximum), arithmetic means, and standard deviations for systolic readings. Inferential bivariate testing was then executed via the Wilcoxon signed-rank test to account for the dependent, paired nature of the bilateral systolic measurements recorded per individual. Statistical significance was established at a threshold of $p < 0.05$ to evaluate inter-arm systolic variations.

RESULTS

Based on the characteristics of the respondents, the majority of respondents were 19 years old, namely 35 respondents (64.8%), followed by those aged 18 years with 15 respondents (27.8%), and those aged 20 years with 4 respondents (7.4%). Regarding gender, the majority of respondents were female, consisting of 42 respondents (77.8%), while 12 respondents (22.2%) were male (Table 1).

Table 1 Respondent Characteristics based on Age and Gender at the Diploma Three Nursing Study Program, Sidoarjo Campus, Health Polytechnic of the Ministry of Health Surabaya, February 2026 (N = 54)

Respondent Characteristics	Frequency (n)	Percentage (%)
Age (years)		
18	15	27.8
19	35	64.8
20	4	7.4
Total	54	100.0
Gender		
Male	12	22.2
Female	42	77.8
Total	54	100.0

Based on the sample distribution, findings indicated that right-arm systolic blood pressure was most frequently observed at 110 mmHg, representing 22 participants (40.7%). Subsequent distributions included systolic readings of 120 mmHg in 15 subjects (27.8%) and 100 mmHg in 11 subjects (20.4%). Conversely, lower systolic values of 80 mmHg and 90 mmHg were less prevalent, comprising 3 individuals (5.6%) per group (Table 2).

Table 2 Distribution of Respondents based on Right-Arm Systolic Blood Pressure at the Diploma Three Nursing Study Program, Sidoarjo Campus, Health Polytechnic of the Ministry of Health Surabaya, February 2026 (N = 54)

Right-Arm Systolic Blood Pressure	Frequency (n)	Percentage (%)
80 mmHg	3	5.6
90 mmHg	3	5.6
100 mmHg	11	20.4
110 mmHg	22	40.7
120 mmHg	15	27.8
Total	54	100.0

Based on the sample distribution, data revealed that left-arm systolic measurements peaked at 110 mmHg, comprising 19 subjects (35.2%). Next in frequency were systolic values of 100 mmHg recorded in 14 participants (25.9%) and 90 mmHg in 12 participants (22.2%). Conversely, a lower frequency of subjects exhibited a reading of 120 mmHg, with 6 respondents (11.1%), while 80 mmHg was identified in 3 individuals (5.6%) (Table 3).

Table 3 Distribution of Respondents based on Left-Arm Systolic Blood Pressure at the Diploma Three Nursing Study Program, Sidoarjo Campus, Health Polytechnic of the Ministry of Health Surabaya, February 2026 (N = 54)

Left-Arm Systolic Blood Pressure	Frequency (n)	Percentage (%)
80 mmHg	3	5.6
90 mmHg	12	22.2
100 mmHg	14	25.9
110 mmHg	19	35.2
120 mmHg	6	11.1
Total	54	100.0

Comparative analysis of bilateral upper-limb pressure demonstrated that most level-one students exhibited elevated right-arm systolic readings relative to the left arm, representing 29 respondents (53.7%). Meanwhile, 25 participants (46.3%) displayed equivalent bilateral systolic values, whereas zero subjects (0.0%) demonstrated lower right-arm pressure compared to the left. On the whole, these results suggest that systolic blood pressure predominantly favored higher right-side measurements among incoming nursing students (Table 4).

Table 4 Frequency Distribution of Respondents based on Differences in Right- and Left-Arm Systolic Blood Pressure at the Diploma Three Nursing Study Program, Sidoarjo Campus, Health Polytechnic of the Ministry of Health Surabaya, February 2026 (N = 54)

Differences in Right- and Left-Arm Systolic Blood Pressure	Frequency (n)	Percentage (%)
Unchanged blood pressure	25	46.3
Decreased blood pressure	0	0.0
Increased blood pressure	29	53.7
Total	54	100.0

Assessment of dextral upper-extremity systolic values revealed a minimum reading of 80 mmHg and a maximum of 120 mmHg. Average systolic blood pressure was recorded at 107.96 mmHg, accompanied by a standard deviation of 10.88 mmHg. This average reading demonstrates that participant blood pressure levels generally aligned with normal physiological parameters for young adults. Meanwhile, the standard deviation of 10.88 mmHg reflects moderate variability across the sample, indicating that individual values remained relatively clustered around the mean (Table 5).

Table 5 Frequency Distribution of Respondents based on Right-Arm Systolic Blood Pressure Measurements at the Diploma Three Nursing Study Program, Sidoarjo Campus, Health Polytechnic of the Ministry of Health Surabaya, February 2026 (N = 54)

	n	Minimum (mmHg)	Maximum (mmHg)	Mean (mmHg)	Standard Deviation (SD)
Right-Arm Systolic Blood Pressure	54	80.00	120.00	107.9630	10.88181
Valid N (listwise)	54				

Evaluation of sinistral upper-extremity systolic values across 54 subjects revealed a minimum reading of 80 mmHg alongside a maximum peak of 120 mmHg. Average systolic pressure reached 102.41 mmHg, accompanied by a standard deviation of 10.98 mmHg. These outcomes demonstrate that participant systolic readings predominantly fell within healthy reference thresholds, displaying relatively low dispersion across the sample cohort (Table 6).

Table 6 Frequency Distribution of Respondents based on Left-Arm Systolic Blood Pressure Measurements at the Diploma Three Nursing Study Program, Sidoarjo Campus, Health Polytechnic of the Ministry of Health Surabaya, February 2026 (N = 54)

	n	Minimum (mmHg)	Maximum (mmHg)	Mean (mmHg)	Standard Deviation (SD)
Left-Arm Systolic Blood Pressure	54	80.00	120.00	102.4074	10.97771
Valid N (listwise)	54				

Comparative evaluation of bilateral upper-limb systolic readings revealed that dextral measurements predominantly clustered at 110 mmHg (40.7%) and 120 mmHg (27.8%). Correspondingly, sinistral readings also peaked at 110 mmHg, albeit at a smaller proportion (35.2%), followed by 100 mmHg (25.9%) and 90 mmHg (22.2%). Non-parametric inferential testing via the Wilcoxon signed-rank test produced a significance level of $p = 0.000$ ($p < 0.05$). Consequently, the alternative hypothesis was confirmed, signifying a statistically meaningful divergence in bilateral systolic blood pressure measurements (Table 7).

Table 7 Comparison of Right- and Left-Arm Systolic Blood Pressure Measurements.at the Diploma Three Nursing Study Program, Sidoarjo Campus, Health Polytechnic of the Ministry of Health Surabaya, February 2026 (N = 54)

Right-Arm Systolic Blood Pressure (mmHg)	Left-Arm Systolic Blood Pressure (mmHg)					Total
	80	90	100	110	120	
80	3	-	-	-	-	3 (5.6)
90	-	3	-	-	-	3 (5.6)
100	-	9	2	-	-	11 (20.4)
110	-	-	11	11	-	22 (40.7)
120	-	-	1	8	6	15 (27.8)
Total	3 (5.6)	12 (22.2)	14 (25.9)	19 (35.2)	6 (11.1)	54 (100.0)

Wilcoxon signed-rank test: $p < 0.001$

DISCUSSION

1. Right-Arm Systolic Blood Pressure Measurement Among First-Year College Students

The majority of first-year college students had right-arm systolic blood pressure values within the normal physiological range (100–120 mmHg), indicating normal cardiovascular function in healthy young adults. Because all participants had no history of hypertension and were measured under resting conditions, the findings likely reflect normal hemodynamic regulation rather than pathological changes.

As outlined in the *Guyton and Hall Textbook of Medical Physiology*, cardiac output along with systemic vascular resistance serve as the primary determinants of systolic pressure. Subtle fluctuations in systolic readings can stem from various physiological dynamics, such as autonomic nervous system activity, patient positioning, psychological stress, and arterial compliance. Consequently, the recorded arterial pressure values align with expected physiological adaptations in a normotensive, healthy cohort.

These findings are in agreement with Clark Christopher E. (2015), who reported that inter-arm blood pressure differences are common and that the right arm often yields slightly higher systolic blood pressure values. Even though recorded hemodynamics across this investigation fell within healthy reference limits, rigorous adherence to standardized measurement protocols is imperative to ensure robust cardiovascular evaluations.

2. Left-Arm Systolic Blood Pressure Measurement Among First-Year College Students

The left-arm systolic blood pressure of the first-year college students was generally within the normal physiological range, indicating stable cardiovascular function in healthy young adults. Since all participants had no history of hypertension and were measured under resting conditions, the findings are considered to reflect normal hemodynamic regulation.

According to the *Guyton and Hall Textbook of Medical Physiology*, blood pressure is regulated through neural and hormonal mechanisms that maintain cardiovascular homeostasis. Minor variations in systolic blood pressure among healthy individuals are therefore considered normal physiological responses.

These findings are consistent with those reported by Clark Christopher E., who found that blood pressure in healthy young adults generally remains within the normal range and that inter-individual differences are physiologically acceptable.

3. Differences in Right- and Left-Arm Blood Pressure Measurements Among First-Year College Students

Empirical outcomes confirmed a statistically meaningful variance in inter-arm systolic levels across freshman undergraduates. The majority of subjects exhibited elevated right-sided systolic pressure, whereas the remainder presented equal bilateral measurements.

As referenced in the *Guyton and Hall Textbook of Medical Physiology*, bilateral arterial pressure measurements do not consistently yield congruent values. Minor inter-arm discrepancies are regarded as clinically physiological, provided they remain below established pathological thresholds. Hence, the variance documented in this study likely reflects benign physiological divergence rather than underlying vascular pathology. The subtle elevation in dextral systolic readings can be attributed to structural branching configurations off the aortic arch, leading to slight physiological hemodynamic disparities across limbs.

Such empirical observations underscore the necessity of bilateral blood pressure screening, especially throughout baseline clinical evaluations, to capture the most representative hemodynamic parameter and enhance overall diagnostic precision. Furthermore, strict compliance with standardized arterial pressure measurement guidelines remains crucial for securing accurate and dependable clinical outcomes.

In an investigation involving first-year undergraduates within the Diploma III Nursing Program at the Sidoarjo Campus, Health Polytechnic Ministry of Health Surabaya, a modal systolic reading of 110 mmHg predominated across both dextral (40.7%) and sinistral (35.2%) upper extremities. Bivariate inferential evaluation via the Wilcoxon signed-rank test produced a p-value of < 0.001, confirming a statistically meaningful variance between bilateral upper-limb systolic pressure measurements.

The subtle elevation in dextral systolic pressure could stem from structural variations in arterial branching off the aortic arch, leading to slight physiological hemodynamic disparities across upper extremities

CONCLUSION AND SUGGESTION

1. Conclusion

Empirical data gathered in February 2026 among first-year undergraduates in the Diploma III Nursing Program at the Sidoarjo Campus, Health Polytechnic Ministry of Health Surabaya, reveals that a modal systolic reading of 110 mmHg was most prevalent, observed in the dextral arm among 22 participants (40.7%) and in the sinistral arm among 19 participants (35.2%). Analytical evaluation using the Wilcoxon signed-rank test demonstrated a p-value of < 0.001, confirming a statistically significant disparity between right- and left-arm systolic measurements.

2. Suggestion

a. Suggestions for Respondents

Participants are urged to prioritize cardiovascular wellness through routine arterial pressure screenings. Furthermore, adopting health-promoting behaviors—such as nutritional balance, consistent physical exercise, stress mitigation, and sufficient sleep—is recommended to preserve normotensive status.

b. Suggestions for Healthcare Workers

These empirical insights should inform the rigorous execution of standard operating procedures (SOP) during clinical blood pressure assessment, aligning practices with evidence-based protocols. This is important for improving diagnostic accuracy and preventing misinterpretation of blood pressure values in clinical practice.

c. Suggestions for Future Research

Subsequent investigations should expand sample cohorts and incorporate potential confounding variables affecting inter-arm pressure disparities, including body mass index, physical activity, stress levels, and genetic predisposition to hypertension. Additionally, employing analytical methodologies with advanced multivariate modeling can elucidate the broader clinical implications of bilateral arterial variance.

REFERENCES

Susanti and Sasti, S.C. (2020) "The Effect of Body Position on Blood Pressure in Elderly Patients with Hypertension in the RW 06 Kelurahan Area," Journal of Nursing and Midwifery, 7(1), pp. 116–122. Available at: https://doi.org/10.26699/v7i1.ART.p116.

Marhaendra, Y.A., Basyar, E. and Adrianto, A. (2016) "Blood Pressure Measurement," Hunter-Gatherers in a Changing World, 2(01), pp. 41–58. Available at: https://doi.org/10.14710 dmj.v5i4.16032.

Sharafi M, Amiri Z, Haghjoo E, Afrashteh S, Dastmanesh S, Moghaddam M, Dehghan A, Tabibzadeh H, M.A. (2023) "Association between inter-arm blood pressure differences and cardiovascular disease: results from baseline phase of the Adults Cohort Study," Scientific Reports, 13(1), p. 9648. Available at: https://doi.org/10.1038/s41598-023-36205-1.

Maurizio Zanetti (2023) "International Consensus on Standardized Clinic Blood Pressure Measurement – A Call to Action," The American Journal of Medicine, 136(5), pp. 438- 445.e1. Available at: https://doi.org/10.1016/j.amjmed.2022.12.015.

Sari, S.D. and Legiran. (2024) "Cross-Sectional Design For Midwifery Research," 1(1), pp. 18–25.