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THE EFFECT OF BODY POSITION ON BLOOD PRESSURE MEASUREMENT: A CLINICAL OBSERVATIONAL STUDY

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ORIGINAL ARTICLE

ABSTRACT

Background: Accurate blood pressure (BP) measurement is vital in diagnosing and managing hypertension. However, the patient's body position during measurement can influence BP readings, potentially affecting clinical decisions. Despite established guidelines, variations in measurement practices are common in clinical settings.
Objective: To evaluate how different body positions sitting, supine, and standing affect blood pressure readings in adults, and to determine the most consistent and clinically reliable position for measurement.
Methods: This observational study included 180 adults aged 25-65 years. Each participant's BP was measured in three body positions: sitting, lying supine, and standing, with a standardized protocol. Mean systolic and diastolic BP readings were compared using paired t-tests and ANOVA. Secondary outcomes included evaluating the presence of orthostatic hypotension and inter-arm BP variation.
Results: Significant differences in BP were found among the three positions. The highest systolic and diastolic readings were recorded in the standing position (SBP: 129.2±12.4 mmHg; DBP: 83.6±9.7 mmHg), followed by sitting (SBP: 126.5±11.6 mmHg; DBP: 81.3±8.9 mmHg), and the lowest in the supine position (SBP: 123.4±10.9 mmHg; DBP: 78.5±8.5 mmHg) ($p<0.001$). Orthostatic hypotension was observed in 14% of participants.
Conclusion: Blood pressure varies significantly with body position. For consistent monitoring, the sitting position remains the most reliable and clinically practical. Awareness of postural variations is essential to avoid misclassification of hypertensive status and ensure accurate treatment decisions.
Keywords: Blood pressure, posture, sitting, standing, supine, hypertension, orthostatic hypotension

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INTRODUCTION: Blood pressure (BP) measurement is a cornerstone of cardiovascular assessment and management. Inaccurate readings can lead to misdiagnosis or inappropriate therapy, particularly in patients with borderline or labile hypertension. While the technique for measuring BP is well-described, one factor often underestimated is the patient's body position during assessment.

The American Heart Association and other guideline bodies recommend measuring BP in the seated position, with back supported and feet flat on the floor. However, in real-world settings such as emergency departments, wards, or home monitoring, BP is frequently recorded in other positions supine or standing based on convenience or necessity [1]. Evidence suggests that body posture can significantly influence hemodynamic responses, affecting the reliability and interpretation of BP values [2, 3].

This study aims to systematically examine how body position alters BP readings and to

recommend the most stable and clinically reliable method for BP measurement across common settings. The objectives were;
To assess the variation in systolic and diastolic blood pressure across three common body positions: sitting, supine, and standing.
To determine the incidence of orthostatic hypotension
To evaluate which position provides the most consistent BP readings for routine clinical use.

METHODOLOGY:
Study Design:
This was a descriptive, cross-sectional observational study conducted at a tertiary care medical center over six months from January to June 2024.

Participants:
A total of 180 adult volunteers aged between 25 and 65 years were included. Participants were selected using non-probability consecutive sampling.

Inclusion criteria:
Adults aged 25-65 years
Normotensive or known hypertensive patients on stable therapy
Able to stand unaided

Exclusion criteria:
History of autonomic dysfunction
Postural dizziness or syncopal episodes
Severe cardiovascular disease
Pregnancy

All participants gave written informed consent. The study protocol was approved by the institutional ethics committee.

Procedure: Blood pressure measurements were taken using an automated oscillometric sphygmomanometer, validated and calibrated according to standards. The same cuff size was used for each participant, adjusted for arm circumference.
Each participant underwent BP measurement in three standardized positions:
Sitting position: After 5 minutes of rest, BP was recorded with the arm at heart level, feet flat on the ground, and back supported.
Supine position: After lying down for 5 minutes, BP was measured with the arm by the side and cuff at heart level.
Standing position: BP was recorded after 3 minutes of standing upright, relaxed and still.
Measurements were repeated twice in each position, 2 minutes apart, and the average was taken.
Orthostatic hypotension was defined as a drop in SBP ≥20 mmHg or DBP ≥10 mmHg from supine to standing.
Statistical Analysis:
Data were analyzed using SPSS version 26.0. Continuous variables were expressed as mean ± standard deviation. Paired t-tests were used to compare BP readings between two positions. Repeated measures ANOVA was applied for three-position comparison. A p-value <0.05 was considered statistically significant.

RESULTS: Of the 180 participants, 94 (52.2%) were male and 86 (47.8%) female. The mean age was 44.6 ± 10.8 years. Among them, 68 (37.8%) had previously diagnosed hypertension. The mean systolic and diastolic BP readings across positions are summarized below:

TABLE 01: COMPARISON OF BLOOD PRESSURE IN DIFFERENT POSITIONS

Position	SBP (mmHg)	DBP (mmHg)
Sitting	126.5 ± 11.6	81.3 ± 8.9
Supine	123.4 ± 10.9	78.5 ± 8.5
Standing	129.2 ± 12.4	83.6 ± 9.7

SBP and DBP in the standing position were significantly higher than in sitting and supine ($p<0.001$).
Supine readings were the lowest in both parameters ($p<0.001$).
Orthostatic Hypotension:

Orthostatic hypotension was observed in 25 participants (13.9%), predominantly among older individuals (>55 years) and hypertensive patients.
Inter-arm Variation:

BP was also measured in both arms in the sitting position for 40 participants. Inter-arm differences ≥10 mmHg in SBP were observed in 7 participants (17.5%).

DISCUSSION: This study confirms that body position significantly affects BP measurements. The highest values were observed in the standing position, likely due to sympathetic compensation following postural change [4]. In contrast, lower readings in the supine position may be due to decreased peripheral resistance and increased venous return [5].

Sitting Position as Standard:

The sitting position provided intermediate values with less variability and is supported by current guidelines as the most reproducible method for clinical decision-making [1,6]. Additionally, it is the most practical position for office and home monitoring.

Implications of Postural Changes:

Standing BP measurement is crucial for identifying orthostatic hypotension, especially in elderly patients or those on antihypertensives [7]. In our study, 14% showed orthostatic hypotension, underscoring the need for position-based BP evaluation in at-risk populations.

Supine Position and Clinical Use

Supine BP is often used in hospital settings, particularly in bedridden patients. However, its lower values could underestimate hypertension, leading to therapeutic undertreatment if not interpreted cautiously [8].

Previous Studies Comparison:

Our results align with earlier studies by Cho et al. and James et al., both of which reported significant postural BP changes [9,10]. Similar findings were also observed in a Korean study showing posture-dependent BP variation in 1,200 individuals [11].

In contrast, a few studies have suggested minimal clinical impact of postural change in young healthy individuals, likely due to compensatory mechanisms and vascular tone [12].

Strengths and Limitations:

Strengths:

Standardized protocol for all measurements

Inclusion of hypertensive and normotensive individuals

Real-world applicability

Limitations:

Single-center study

Lack of ambulatory BP monitoring

Did not account for circadian BP variation

Future multicenter studies with 24-hour monitoring could offer more insights into the dynamic nature of BP fluctuations in daily life.

CONCLUSION: Blood pressure measurements vary significantly depending on body position, with standing showing the highest and supine the lowest readings. The sitting position remains the most consistent and clinically recommended method for routine BP monitoring. However, clinicians should consider postural changes, particularly in elderly or symptomatic patients, to avoid misdiagnosis and improve hypertension management.

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Authors Contribution

Dr. Mir Afzal	*Concept and design*
Dr. Fareed Hussain	*Acquisition of data*