

Blood Pressure Values Based on Body Position

Chelsea Iriani Windewani^{1*}, Frendy Fernando Pitoy²

Nursing Profession Program, Faculty of Nursing, Universitas Klabat, Airmadidi

Corresponding E-mail: Chelsea@unklab.ac.id

Abstract – *The purpose of this study was to evaluate the effect of body position on blood pressure values, specifically comparing the sitting and supine positions. Blood pressure is a critical parameter for assessing health status, and its measurement can be influenced by various factors, including body posture. This study employed a comparative research design with a total sampling method, involving 99 students from the Professional Nurse Program, Faculty of Nursing, Universitas Klabat. Blood pressure measurements were obtained using a digital sphygmomanometer, and data were analyzed using an independent t-test with SPSS software. The findings indicated no significant differences in blood pressure values between the sitting and supine positions, both for systolic ($p = .812$) and diastolic ($p = .237$) measurements. These results suggest that body position does not significantly affect blood pressure measurement outcomes in the studied population. This supports flexibility in clinical procedures, allowing blood pressure to be measured in the patient's preferred position without compromising accuracy. Further research is recommended with more diverse populations, including individuals with specific health conditions, to enhance the generalizability of these findings.*

Keywords: *Blood Pressure, Body Position, Professional Nurse Students*

I. INTRODUCTION

Blood pressure is a fundamental physiological parameter that reflects the force exerted by circulating blood on the walls of the arteries as the heart contracts and relaxes. It is one of the most used indicators for assessing an individual's cardiovascular and overall health status (Dumalang et al., 2022). Moniaga (2013) defines blood pressure as the force necessary to maintain the continuous flow of blood throughout the body, while Putra (2019) emphasizes that blood pressure fluctuates with the cardiac cycle, peaking during systole and reaching its lowest point during diastole.

In adults, the average blood pressure is typically around 120/80 mmHg, with a normal range between 95–145/60–90 mmHg. Blood pressure tends to increase with age, resulting in a broader normal range for the elderly. During childhood, values are generally similar between males and females, but post-puberty, females tend to have lower blood pressure than males (Lapum et al., 2018). Multiple intrinsic and extrinsic factors can influence blood pressure readings, including physical activity, psychological stress, time of day, and notably, the individual's body position prior to measurement (Julianto & Yudono, 2020; Cohen et al., 2020).

Accurate blood pressure measurement is essential in clinical nursing practice, as deviations from the norm may indicate the presence of hypertension, hypotension, or other underlying health

issues. The accuracy of these measurements can be significantly affected by procedural elements, such as the patient's posture. In clinical settings, patients are often asked to lie down during blood pressure assessments, a practice informed by clinical judgment and comfort considerations (Yulastuti et al., 2021). However, this practice varies across healthcare settings, and the most appropriate position for accurate measurement remains a subject of ongoing investigation.

Several studies have reported varying results concerning the influence of body position on blood pressure readings. Gordon et al. (2011) found that blood pressure tends to be higher in the supine position, whereas Manembu et al. (2015) reported higher readings in the sitting position. Jati Nugroho and Lontoh (2021) argued that the supine position yields more consistent and accurate readings, particularly for patients who experience discomfort or difficulty when sitting upright. This position is believed to reduce the gravitational effects on blood flow, resulting in more stable values. Similarly, Solitaire et al. (2019) highlighted the necessity of using the supine position for hospitalized patients with limited mobility. In contrast, Laily and Tualeka (2023) emphasized that in outpatient settings such as clinics and community health centers, the sitting position is more practical, enabling better interaction between patients and healthcare providers while streamlining patient flow.

Despite recommendations to use the supine position in some clinical contexts, this practice has raised questions regarding its universal applicability and clinical justification. Nurses may rely on habitual practices or personal preferences rather than evidence-based guidelines when selecting a measurement position. This inconsistency may result in variability in blood pressure readings, potentially affecting clinical decision-making. Furthermore, there is limited research focusing on healthy adult populations without underlying cardiovascular conditions, which could provide baseline data for more generalized recommendations. Given these varying perspectives and inconsistencies in existing literature, this study aims to examine the effect of body position specifically the sitting and supine positions on blood pressure values in a population of nursing students with normal blood pressure ranges. The findings are expected to contribute to the development of standardized practices for blood pressure measurement that enhance both clinical efficiency and diagnostic accuracy.

II. LITERATURE REVIEW

Blood pressure is the force exerted by the blood pumped by the heart throughout the body, and it consists of two types: systolic pressure, which is the highest pressure occurring when the ventricles contract and expel blood into the arteries, and diastolic pressure, which is the lowest pressure occurring when the ventricles relax and fill with blood from the atria (Amiruddin et al., 2015). According to the American Heart Association, blood pressure is defined as the pressure of circulating blood on the walls of blood vessels, which is crucial for maintaining adequate perfusion to tissues and organs (Whelton et al., 2018). Both types of pressure are essential as they serve as key indicators in identifying potential disturbances in the cardiovascular system, which can be categorized as high, normal, or low (Unger et al., 2020).

Blood pressure measurement can be influenced by various factors, one of which is body position during assessment. A study conducted by Nimar, Sikka, and Yadav (2024) concluded that different body positions, such as sitting or lying supine, can result in significant variations in blood pressure readings. Measurements taken in the sitting position generally yield higher blood pressure

values compared to those taken in the supine position. This phenomenon is supported by findings indicating that positional changes can affect both systolic and diastolic blood pressure due to alterations in blood distribution caused by gravity and the activity of the autonomic nervous system.

Another study by Çobanoğlu and Bahadır Yılmaz (2024) investigated blood pressure variations in surgical patients across three different positions: supine, semi-Fowler, and Fowler. The results demonstrated a tendency for blood pressure to increase progressively from the supine position to the semi-Fowler and then to the full Fowler (sitting) position. This finding is particularly relevant for hospitalized patients, as their resting posture may influence the clinical evaluation of blood pressure. Additionally, Park et al. (2024) compared blood pressure measurements between seated positions on a chair and on the floor. They found comparable results, provided that the back was adequately supported and the arm was positioned at heart level. Furthermore, a study by Tamiya et al. (2024) revealed that prolonged sitting (approximately three hours) can lead to an increase in diastolic blood pressure and mean arterial pressure when compared to lying down. This randomized crossover trial, conducted on healthy young men, highlighted that extended sedentary sitting may contribute to early-onset hypertension, particularly among individuals with a sedentary lifestyle. Thus, body position not only affects immediate blood pressure readings but also plays a role in long-term blood pressure regulation.

Although numerous studies have demonstrated variations in blood pressure based on body position, some research indicates that these differences are not always statistically significant. For example, an observational study by Palatini et al. (1998) found no significant differences in systolic blood pressure (SBP) between the sitting and supine positions, although diastolic blood pressure (DBP) and pulse rate tended to be higher in the sitting position. These findings suggest that changes in body position do not necessarily result in significant alterations across all components of blood pressure.

Furthermore, a systematic review published in the *Journal of Hypertension* by Smith and Jones (2023) reported that, among nine studies analyzed, two did not show any significant differences between the sitting and supine positions. This highlights the variability in results, which may be influenced by individual factors such as age, vascular status, and the specific measurement method used. Additionally, a randomized crossover study by Tamiya et al. (2024), which involved 16 healthy young men, assessed blood pressure after three hours in both the sitting and supine positions. The results indicated that while SBP did not change significantly between conditions, both DBP and mean arterial pressure (MAP) were elevated in the sitting position.

A large cohort study reported by *Europe PMC* (2018) found that approximately 27% of study participants did not experience significant changes in blood pressure between the sitting and supine positions. This finding indicates that not all individuals exhibit the same physiological response to changes in body position. Consequently, while body position is an important variable in blood pressure measurement, the relationship between posture such as lying down or sitting and blood pressure is not always statistically significant. Therefore, in clinical practice, it is essential to consider individual patient conditions and to ensure consistency in positioning during blood pressure assessment to improve the accuracy and reliability of measurement interpretation.

III. MATERIALS AND METHODS

This study employs comparative research design. Comparative research design is a method aimed at comparing two or more groups, variables, or conditions to identify similarities and differences among them (Laila Wu, 2021). The population in this study consists of professional nursing students currently enrolled at Klabat University during the second semester of the 2024/2025 academic year. A total of 99 respondents participated in this study, with all professional nursing students included in the sample. The sampling technique used in this study is total sampling. Total sampling is a sampling technique in which all members of the population are used as the sample, typically applied when the population is relatively small (Firmansyah, D., 2022).

The primary instrument used in this study was a digital blood pressure monitor (sphygmomanometer) that had been previously calibrated to ensure accuracy and reliability. The device was used to measure each participant's systolic and diastolic blood pressure in two different body positions: supine (lying down) and sitting. The same blood pressure monitor was used consistently throughout the data collection process to maintain uniformity and minimize measurement bias. In addition to the blood pressure monitor, a stopwatch was utilized to ensure that the resting period between position changes ranging from 5 to 10 minutes was properly timed for each participant. The environment, including the room temperature and setup, was kept constant to minimize external variables that could affect the readings. An observation sheet was employed to record blood pressure measurements along with body positions during the study, as well as to document any other relevant information. Writing instruments were also required for documentation purposes throughout the research process. In addition, a designated room was prepared to ensure a controlled environment during data collection. Several chairs and space for participants to lie down were also arranged to facilitate the various body positions required during blood pressure measurement. By utilizing these instruments and facilities, the research could be carried out systematically to analyze the effect of body position on blood pressure values.

This study was conducted among 99 professional nursing students at Universitas Klabat. Data collection was carried out immediately after a scheduled joint class session. The researcher first requested the students to remain in the room for a short period before leaving. A brief explanation was then provided regarding the aims and objectives of the study. The researcher emphasized that participation was entirely voluntary, and there was no element of coercion. Participants who chose not to take part were free to leave the room without any consequences. The data collection was conducted in the Conference Room located on the second floor of Lecture Hall Building 1 (GK 1). The room is equipped with an air conditioning system, providing a comfortable environment that supports the smooth execution of the research procedure.

After obtaining informed consent from those who agreed to participate, the researcher arranged several cushioned red chairs with padded backrests and seats. These chairs were connected to form a bed-like surface, allowing participants to lie down comfortably with their arms supported and not left

hanging freely. Each participant was given approximately 5 to 10 minutes to rest in a supine position and relax before the first blood pressure measurement was taken. Following this rest period, the researcher measured the participant's blood pressure in the lying (supine) position. Subsequently, the participants were instructed to shift to a sitting position. Again, they were given a rest period of 5 to 10 minutes to allow their body to adjust. After the rest period, the second blood pressure measurement was taken in the sitting position. This procedure was applied consistently to all participants throughout the data collection process. The data in this study were analyzed using inferential statistical methods, specifically the independent *t*-test. The Independent *t*-test was employed to compare the mean blood pressure values between two different and unrelated body positions (supine and sitting). This type of test is appropriate when assessing differences between two independent conditions or groups. The statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) software to facilitate accurate and efficient data processing (Syafriani et al., 2023). Prior to inputting the data into SPSS, the researcher first tabulated and organized the raw data using Microsoft Excel.

IV. RESULTS AND DISCUSSION

This study aimed to compare systolic and diastolic blood pressure values in sitting and supine positions. The collected data were analyzed to determine whether there was a statistically significant difference between the two body positions. The results of the statistical analysis are presented in tables and interpreted based on the significance values obtained from the independent *t*-test. In this section, the research findings are described in detail, followed by a discussion that connects the results with relevant theories and previous studies. The findings are expected to provide new insights into the effect of body position on blood pressure, contributing to a deeper understanding of physiological responses in clinical and non-clinical settings.

Table 1. Descriptive Analysis of Systolic Blood Pressure Values in Sitting and Supine Positions

| Kategori | Normal | | Pre Hpt | | Hpt 1 | | Hpt 2 | | Total | |
|------------------|--------|------|---------|------|-------|-----|-------|---|-------|-----|
| | f | % | f | % | f | % | f | % | f | % |
| Sitting position | 76 | 76.8 | 22 | 22.2 | 1 | 1.0 | 0 | 0 | 99 | 100 |
| Supine position | 86 | 86.9 | 13 | 13.1 | 0 | 0 | 0 | 0 | 99 | 100 |

HPT: Hypertension, F: Frequency

Table 1 presents the descriptive analysis of systolic blood pressure (SBP) values measured in sitting and supine positions, categorized according to the standard classification of blood pressure levels: Normal, Prehypertension (Pre Hpt), Hypertension Stage 1 (Hpt 1), and Hypertension Stage 2 (Hpt 2). In the sitting position, most respondents (76 individuals or 76.8%) were classified as having normal systolic blood pressure. A smaller proportion (22 individuals or 22.2%) fell into the prehypertension category, while only one participant (1.0%) was identified with stage 1 hypertension. No participants were recorded as having stage 2 hypertension in the sitting position. In the supine position, a higher proportion of participants (86 individuals or 86.9%) exhibited normal systolic blood

pressure, while the remaining 13 individuals (13.1%) were classified under prehypertension. Notably, no cases of stage 1 or stage 2 hypertension were observed in the supine position. These findings suggest a slight improvement in systolic blood pressure readings when participants were in the supine position compared to the sitting position, as evidenced by the increase in the proportion of normal SBP values and the absence of hypertensive classifications.

Table 2. Descriptive Analysis of Diastolic Blood Pressure Values in Sitting and Supine Positions

| Kategori | Normal | | Pre Hpt | | Hpt 1 | | Hpt 2 | | Total | |
|-------------------------|--------|------|---------|------|-------|---|-------|-----|-------|-----|
| | f | % | f | % | F | % | f | % | f | % |
| Sitting Position | 81 | 81.8 | 17 | 17.2 | 0 | 0 | 1 | 1.0 | 99 | 100 |
| Supine Position | 96 | 97.0 | 3 | 3.0 | 0 | 0 | 0 | 0 | 99 | 100 |

HPT: Hypertension, F: Frequency

Table 2 presents a descriptive analysis of diastolic blood pressure (DBP) values measured in sitting and supine positions, categorized into four standard classifications: Normal, Prehypertension (Pre Hpt), Hypertension Stage 1 (Hpt 1), and Hypertension Stage 2 (Hpt 2). In the sitting position, most participants (81 individuals or 81.8%) had normal diastolic blood pressure. Additionally, 17 individuals (17.2%) were classified as prehypertensive. There were no cases of stage 1 hypertension, while only one individual (1.0%) was classified under stage 2 hypertension. In contrast, the supine position showed a higher prevalence of normal DBP values, with 96 individuals (97.0%) falling into the normal category and only 3 individuals (3.0%) being classified as prehypertensive. No cases of stage 1 or stage 2 hypertension were observed in the supine position.

Table 3. Comparison of Systolic and Diastolic Blood Pressure Values in Sitting and Supine Positions

| Category | Sig. (2-tailed) | Interpretation |
|------------------|-----------------|-----------------|
| Systolic | .812 | Not Significant |
| Dyastolic | .237 | Not Significant |

Significant $p < 0,05$.

Table 3 presents the results of a comparative analysis between systolic and diastolic blood pressure values measured in sitting and supine positions. The significance values (Sig. 2-tailed) are reported to determine whether there are statistically significant differences between the two body positions. For systolic blood pressure, the significance value was **.812**, which is substantially greater than the conventional alpha level of 0.05. This indicates that there is no statistically significant difference in systolic blood pressure measurements between the sitting and supine positions. Similarly, for diastolic blood pressure, the significance value was **.237**, which also exceeds the 0.05 threshold. This suggests that the difference in diastolic blood pressure between the two positions is likewise not statistically significant. In summary, although the descriptive analysis (Tables 1 and 2) showed a tendency for improved blood pressure values in the supine position, the statistical comparison in Table 3 indicates that these differences are not significant at the 5% level. Therefore, it can be concluded that

changes in body position from sitting to supine do not result in statistically significant alterations in either systolic or diastolic blood pressure in this sample. These findings highlight the importance of considering both clinical relevance and statistical significance when interpreting blood pressure variations across different body positions.

Previous studies have also examined the effect of body position on blood pressure measurement. A study conducted by Ehmann et al. (2020) found that systolic blood pressure among college students did not show significant differences related to body position (e.g., sitting or lying down). This study emphasized that other factors, such as body mass index (BMI) and the time of measurement (morning, afternoon, evening), contributed more to blood pressure variability than body position. Furthermore, research conducted at SMA Kristen 1 Tomohon reported that the average systolic blood pressure in the sitting position was 110.5 mmHg, and in the lying position was 109.8 mmHg. This difference was not statistically significant, indicating that body position did not substantially affect systolic blood pressure (Solitaire & Rumampuk, 2019).

The statistical test results for diastolic blood pressure showed a p-value of 0.237, which is also greater than 0.05. This suggests that there was no significant difference in diastolic blood pressure between sitting and lying positions. Descriptive data showed that most respondents in the lying position (97.0%) and sitting position (81.8%) had normal diastolic blood pressure. This small difference was not strong enough to be considered statistically significant. A study conducted at the Faculty of Medicine, Tarumanagara University, found that changes in diastolic blood pressure across lying, sitting, and standing positions tended to be insignificant. In this study, diastolic blood pressure was recorded as 79.13 mmHg in the sitting position, 77.13 mmHg in the lying position, and 79.28 mmHg in the standing position. Statistical tests revealed no significant differences between the lying and sitting positions ($p = 0.070$) (Lontoh & Gunawan, 2022). Under normal physiological conditions, the body maintains homeostasis to keep blood pressure stable despite changes in posture. This mechanism explains the lack of significant differences between sitting and lying positions (Hall, 2016). These findings suggest that body position (sitting or lying down) does not significantly impact blood pressure among the university student population studied. Therefore, blood pressure measurements can be taken in whichever position is most comfortable for the patient, without significantly affecting the results. This supports flexibility in clinical procedure settings.

V. CONCLUSION

The purpose of this study was to examine whether body position specifically sitting versus lying down significantly influences systolic and diastolic blood pressure among university students. Based on the findings, the study concludes that there is no statistically significant difference in blood pressure values between the two positions. These results are supported by descriptive data, in which most participants in both positions exhibited blood pressure within the normal range, and by inferential analysis showing p-values greater than 0.05 for both systolic and diastolic measures. These findings contribute to the existing body of knowledge by reinforcing the understanding that, in normotensive individuals, postural changes such as sitting and lying do not substantially alter blood pressure values. This outcome aligns with physiological theories of homeostasis, which suggest that the human body maintains stability in blood pressure despite positional shifts. The study adds value by

providing empirical evidence relevant to clinical practice, particularly in supporting flexibility during routine blood pressure assessments where patient comfort may vary. Despite its contributions, this study has several limitations. The sample was limited to university students within a narrow age range and relatively healthy physiological profiles, which may restrict the generalizability of the results to other populations, such as older adults or individuals with hypertension or cardiovascular conditions. Furthermore, other variables such as stress level, physical activity, and time of day were not controlled, which may influence blood pressure outcomes. In light of these limitations, future research is recommended to include more diverse and larger samples that span various age groups, genders, and clinical conditions. Studies that incorporate additional physiological and contextual variables such as body mass index (BMI), medication use, and time-based blood pressure variation could deepen our understanding of the interaction between body position and cardiovascular function. Additionally, further exploration in clinical populations may provide important insights into patient-centered care and the development of standardized guidelines for blood pressure measurement.

AUTHORS' CONTRIBUTIONS

Chelsea Windewani was primarily responsible for the conceptualization and design of the study, refinement of the methodology, data collection, and drafting of the initial manuscript. This research was conducted as part of her final academic requirement in the professional nursing program. Mr. Frendy Pitoy, as the academic advisor, proposed the initial research topic and provided recommendations for the appropriate methodology to be used. He offered continuous supervision, intellectual input, and critical feedback throughout the research and writing process. In addition, he performed statistical data analysis using SPSS to support the research findings.

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