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Analysis of the Schellong Test Measurement as a Screening Method for Orthostatic Disorders in Patients with Hypertension

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Abstract: *The autonomic nervous system, cardiovascular system, and neurohormonal responses play complex roles in maintaining blood pressure stability. Disruption of these compensatory mechanisms may result in abnormal blood pressure fluctuations, either increases or decreases. This study aimed to evaluate the Schellong test as a screening method to identify orthostatic abnormalities in patients with hypertension. A quantitative observational analytic study with a cross-sectional design was conducted. A total of 98 respondents were recruited from eight different locations using cluster random sampling. Participants were aged ≥40 years, had blood pressure >140/90 mmHg, had been diagnosed with hypertension for at least six months, were able to stand independently, and provided informed consent. Most respondents were pre-elderly (62.2%), female (85.7%), had Primary level education (92.9%), and were unemployed (68.4%). Approximately 51% were taking antihypertensive medication, 18.4% had a smoking history, and 50% had a family history of hypertension. Diastolic blood pressure was predominantly grade I (66.3%), while systolic blood pressure was mostly grade II (53.1%). Based on the Schellong test, 20 participants were classified in the normal zone, 23 in Zone 2 (asymptotonic hypotonic reaction), and 55 in Zone 1 (hypertonic reaction). These findings highlight the importance of assessing hemodynamic adaptation to postural changes from supine to standing positions to reduce the risk of falls and cardiovascular complications in patients with hypertension.*

Keywords: *hypertension; screening; Schellong test; orthostatic disorder*

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INTRODUCTION

A major contributor to morbidity and mortality from cardiovascular disease, hypertension is a global health concern. By 2024, 1.4 billion persons globally between the ages of 30 and 79 or 33% of the population in this age group, are predicted to have hypertension. Two-thirds of hypertensive individuals between the ages of 30 and 79 reside in low- and middle-income nations. 44% of individuals with hypertension, or around 600 million people, are not aware that they have the illness. Only around 320 million adults with hypertension (23%) are successfully controlled, compared to about 630 million adults with hypertension (44%) who receive a diagnosis and treatment. The majority of these are either poorly controlled or undiagnosed (WHO, 2025). Data from the Indonesian Health Survey in Indonesia shows that the prevalence of hypertension continues to increase, particularly among adults and the elderly. This condition is exacerbated by unhealthy lifestyle changes such as low-fiber diets, excessive coffee consumption, lack of physical activity, stress, and irregular sleep patterns (Survey Kesehatan Indonesia (SKI), 2023).

The phenomenon of changes in blood pressure due to changes in body position (orthostatic review) is also an important aspect in understanding cardiovascular regulation. Abnormal orthostatic responses, either orthostatic hypotension or orthostatic hypertension, are frequently found in patients with cardiometabolic disorders, including hypertension (Ringer et al., 2026). However, this phenomenon has received little attention in clinical practice and research, particularly in the nursing context. Physiologically, changing position from lying to standing triggers compensatory mechanisms through the autonomic nervous system to maintain cerebral perfusion (Petriceks et al., 2024). An imbalance in this mechanism can cause symptoms such as dizziness, syncope, and an increased risk of falls. In hypertensive patients, an impaired orthostatic response can worsen clinical conditions and increase the risk of complications, such as stroke, heart disease, and reduced quality of life (Hockin et al., 2022).

Increasing age is a significant factor in the development of orthostatic hypotension in hypertensive patients. With age, there is a decrease in blood vessel elasticity and a decrease in the sensitivity of the baroreceptor reflex, which functions to maintain stable blood pressure when changing positions. In elderly people with hypertension, this condition is exacerbated by changes in the structure and function of the cardiovascular system and the possible use of antihypertensive medications that affect blood pressure regulation. This results in a decreased ability of the body to adapt to changes in position from lying or sitting to standing, thereby increasing the risk of orthostatic hypotension (Wiersinga et al., 2025).

In nursing practice, orthostatic assessment is part of the cardiovascular system assessment which has an important role in the early detection of hemodynamic disorders (Crisp et al., 2020). Implementation in the field is often suboptimal, due to time constraints, a lack of specific operational standards, and minimal use of assessment results in planning nursing interventions. Nurses play a strategic role in blood pressure monitoring, patient education, and preventing complications such as injuries from falls (Suladze et al., 2025). Lack of attention to orthostatic responses in hypertensive patients can result in delayed identification of problems, increased incidence of falls, and inaccuracy in providing nursing interventions (Bourke et al., 2024). This suggests a disparity between theoretical knowledge and practical application that necessitates additional exploration. Consequently, this research is essential to examine the occurrence of orthostatic response in individuals with hypertension from a nursing viewpoint. It is anticipated that this study will aid in advancing nursing knowledge, especially in enhancing the standard of cardiovascular evaluations, reinforcing evidence-based practices, and facilitating promotional and preventive strategies in the care of patients with hypertension.

Schellong test offers an easy method for assessing orthostatic blood pressure changes, which involves measuring blood pressure after five minutes in the supine position followed by repeated measurements for seven minutes while standing (Fanciulli et al., 2019). When blood pressure readings taken while lying down show values within the high range of hypertension, and upon standing for seven minutes there is a drop in systolic blood pressure of 20 mmHg or more and/or a decrease in diastolic blood pressure of at least 10 mmHg, along with feelings of dizziness and unsteadiness, the findings point to orthostatic hypotension. This reflects a disruption in the cardiovascular system's ability to adjust to changes in body posture in individuals with hypertension. This situation necessitates careful attention since it heightens the risk of falls and other potential issues, thus requiring suitable observation and action (Fedorowski & Jordan, 2025).

Accurate diagnosis through this simple examination is essential to facilitate appropriate clinical intervention (Simon dkk., 2025). The effectiveness of the Schellong test lies in its direct approach in identifying autonomic dysfunction, particularly orthostatic abnormalities that may be missed in standard clinical assessments. Preventive and early screening using the Schellong test provides a non-invasive and cost-effective examination that can be implemented in various healthcare settings, including facilities with limited access to advanced diagnostic technology. "This study aimed to evaluate orthostatic hypotension using the Schellong test to identify cardiovascular dysregulation in hypertensive patients."

METHODS

This study employed a quantitative observational analytical approach with a cross-sectional design. It was conducted at the Purwojati Community Health Center, focusing on the villages of Karang Talun Kidul and Karang Talun Lor, over a two-month period from August to September 2025. The study population consisted of patients with primary hypertension. Using cluster random sampling, the calculated sample size was 98. Respondents were randomly selected from eight villages: Cibalung, Bojong, Tugu, Pertinggi, Karang Laban, Karang Mangli, Kaliula, and Kalibenda. Inclusion criteria were: a diagnosis of hypertension with blood pressure >140/90 mmHg for at least six months, age ≥40 years, ability to function independently, and provision of informed consent. Exclusion criteria were significant neurological disorders, cardiac arrhythmias, acute cardiovascular conditions, and use of medications known to directly affect autonomic function. Data were collected using a demographic form capturing age, gender, education, hypertension history, smoking history, antihypertensive medication use, and hypertension grade. The Schellong test was measured with an Omron digital tensiometer.

The Schellong test is conducted by having the patient lie flat on their back, followed by taking blood pressure and pulse readings each minute for a total of five minutes, and then calculating the average of the lying down blood pressure and pulse rates. Next, position the patient standing and measure blood pressure and pulse rates every minute for seven minutes. The measurement results are calculated by calculating the difference between the standing measurements minus the average lying measurements. The difference in blood pressure measurements falls into the normal zone category, zone 1, zone 2, zone 2a, or zone 3. The normal zone is characterized by minimal changes in blood pressure, namely a decrease in systolic pressure of <20 mmHg and diastolic pressure of <10 mmHg without accompanied by clinical symptoms, indicating a still good cardiovascular adaptation response. Zone 1 indicates a mild decrease in blood pressure or an increase in heart rate as a form of compensation, but generally not accompanied by significant symptoms. Zone 2 is characterized by a more pronounced decrease in blood pressure accompanied by mild symptoms such as dizziness or weakness, indicating the beginning of impaired orthostatic regulation. Furthermore, zone 2a describes a transitional condition with a more significant decrease in blood pressure and symptoms that begin to interfere with activities, thus requiring clinical alertness. Meanwhile, zone 3 is the most severe condition, characterized by a clear decrease in blood pressure (≥20 mmHg systolic or ≥10 mmHg diastolic) accompanied by clinical symptoms such as severe dizziness, near fainting, or syncope, which indicates orthostatic hypotension and requires immediate treatment.

The Omron HEM-742 digital sphygmomanometer demonstrates good validity because it uses an oscillometric method that has been widely compared with standard auscultation measurements, so it is able to accurately detect changes in blood pressure in various body positions. In the context of orthostatic testing, this device is able to sensitively detect decreases in systolic and diastolic blood pressure according to the criteria for orthostatic hypotension. In terms of reliability, the Omron HEM-742 has high consistency of results in repeated measurements, both in lying and standing positions, with minimal variation during the procedure carried out according to standards. The error indicator and motion detection features also help minimize measurement bias during position changes in the Schellong test. Therefore, this device is considered valid and reliable for use in blood pressure measurements in the Schellong test (Christofaro et al., 2009). Data gathering took place following the receipt of ethical clearance (KEPK/UMP/68/VIII/2025). The study team followed standardized protocols for collecting data from all subjects and utilized representative sampling methods that involved cluster random sampling to reduce selection bias. Data evaluation was carried out based on recognized statistical methods, which included data preparation, coding, and analysis through descriptive statistical tests to illustrate the distribution of participant traits, as well as cross-tabulation analysis to explore the connections between these traits and the outcomes of the Schellong test. All statistical evaluations were executed using SPSS version 27.

RESULTS

The demographic and clinical characteristics of the study participants are presented in Table 1. The table summarizes the participants' age, sex, educational level, employment status, history of hypertension, smoking history, use of antihypertensive medication, and blood pressure levels. These characteristics provide an overview of the study population and describe the clinical factors relevant to the assessment of blood pressure responses during the Schellong test.

Table 1. Respondent characteristics according to age, sex, education level, employment status, hypertension history, smoking history, antihypertensive medication use, and blood pressure levels among the 98 participants.

Variable	N	%	SD
Usia			Min-Max (45-65)
Pre-elderly (45–59 years)	61	62.2	Mean (55,97)
Elderly (60-65 years)	37	37.8	SD 6.430
Sex			
Female	84	85,7	
Male	14	14.3	
Education Level			
Primary Education	91	92,9	
Secondary Education	7	7.1	
Employment Status			
Employed	31	31.6	
Unemployed	67	68,4	
History of hypertension			
Yes	49	50.0	
No	49	50.0	
Smoking History			
Yes	18	18.4	
No	80	81.6	
Regular antihypertensive medication use			
Yes	50	51.0	
No	48	49.0	
Systolic blood pressure (mmHg			Min-Max(120-220)
Grade I (140–159 mmHg)	46	46.9	Average (164,74)
Grade II (≥160 mmHg)	52	53.1	SD: 19,933
Diastolic blood pressure (mmHg)			
Grade I (90–99 mmHg)	65	66.3	Min-Max (89-127)
Grade II (≥100 mmHg)	33	33.7	Average (99,51)
			SD: 10.470

Table 2 presents the cross-tabulation of the Schellong test results with the participants' demographic and clinical characteristics. The analysis examines the distribution of Schellong test outcomes according to age, sex, educational level, employment status, history of hypertension, smoking history, antihypertensive medication use, and blood pressure levels. This comparison provides an overview of the potential relationships between participant characteristics and orthostatic blood pressure responses.

Table 2. Cross-tabulation of Schellong test variables with age, sex, educational level, employment status, history of hypertension, smoking history, antihypertensive medication use, and blood pressure.

Variable	Zone 1	Zone 2	Normal Zone
Age			
Pre-elderly (45–59 years)	34	14	13
Elderly (60-65 years)	21	9	7
Sex			
Female	50	17	17
Male	5	6	3
Education Level			
Primary Education	55	23	20
Secondary Education	52	21	18
Employment Status			
Employed	16	8	7
Unemployed	39	15	13
History of hypertension			
Yes	25	12	12
No	30	11	8
Smoking History			
Yes	9	5	4
No	46	18	16
Regular antihypertensive medication use			
Yes	23	13	14
No	32	10	6
Systolic blood pressure (mmHg			
Grade I (140–159 mmHg)	25	9	12
Grade II (≥160 mmHg)	30	14	8
Diastolic blood pressure (mmHg)			
Grade I (90–99 mmHg)	36	17	12
Grade II (≥100 mmHg)	19	6	8

Figure 1. Visually presents the results of the Schellong test measurements for Hypertensive patients, showing that 20 respondents fell within the normal zone, 55 in Zone 1, and 23 in Zone 2.

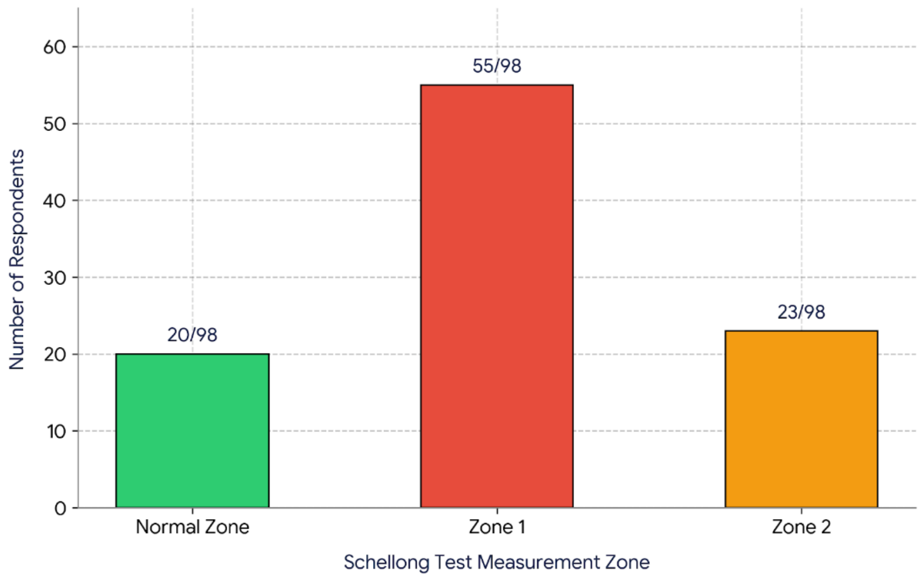

Figure 1. The results of the Schellong test measurements for Hypertensive patients

DISCUSSIONS

Of the characteristics examined, most fell into Zone 1. This zone is a hypertonic reaction characterized by changes in blood pressure and heart rate that remain within conventional limits, namely a decrease in systolic blood pressure (SBP) of less than 20 mmHg and a decrease in diastolic blood pressure (DBP) of less than 10 mmHg, and an increase in heart rate of less than 20 beats per minute. This zone represents a marginal orthostatic response that needs to be monitored, as it can indicate the early stages of autonomic dysfunction (Perlmuter et al., 2011). This Zone 1 finding indicates a hypertonic response indicating excessive activation of the sympathetic nervous system during the transition from the supine to the upright position (Juraschek et al., 2024).

The results of these measurements indicate a disturbance in the autonomic regulatory mechanism, which results in a hypertensive reaction when standing (Palatini et al., 2025). A hypertonic response indicates excessive sympathetic activity or cardiovascular dysregulation, autonomic stress, or uncontrolled hypertension. Impaired blood pressure regulation exacerbates existing hypertension, increasing cardiac workload, leading to symptoms such as headache, palpitations, and discomfort upon standing. A hypertonic response in hypertensive patients is a marker of impaired orthostatic adaptation, which can compromise long-term hemodynamic stability (Choi et al., 2024).

A small proportion of measurements fell within the normal range. This finding suggests adaptive blood flow perfusion, with circulatory regulatory mechanisms, including baroreceptors, functioning efficiently to maintain cerebral perfusion during standing. This pattern indicates the absence of orthostatic pathology, characterized by the absence of a significant decrease in blood pressure or an abnormal increase in heart rate. This adaptation may occur in hypertensive individuals who effectively manage their blood pressure through appropriate dietary interventions, such as adherence to the DASH diet (Daley & Vadakekut, 2026), consistent self-management behaviors, regular use of hypertension medication, and a strong family support system (Wu et al., 2024). In the normal range, only minimal decreases in systolic and diastolic blood pressure were observed, and the increase in heart rate remained consistent with normal compensatory mechanisms to maintain cerebral perfusion. This finding suggests intact autonomic regulatory function, particularly baroreflex integrity, which prevents hypotension or excessive sympathetic responses (Juraschek et al., 2024).

Some are in Zone 2, also referred to as asymptotonic hypotonia, which is defined by a rise in heart rate of more than 10 beats per minute and a drop in systolic blood pressure of more than 8 mmHg. In this area, the parasympathetic neural system predominates while sympathetic nervous system activity is reduced. Blood pressure cannot be maintained during posture changes by sympathetic involvement alone (Ooi et al., 2024). Insufficient sympathetic activation during orthostatic stress will result in parasympathetic dominance, thus disrupting the body's ability to regulate blood pressure during changes in lying and standing positions Parasympathetic dominance during orthostasis lessens the efficiency of vasoconstriction required to maintain an upright position, even while resting blood pressure is still elevated. A hypotonic response pattern, or lower systolic blood pressure, is the outcome of this disorder. In hypertensive patients, this mismatch between dominating parasympathetic effect and diminished sympathetic activity suggests poor autonomic regulation and inadequate adjustment to postural changes (Sorola et al., 2025).

Zones 2a and 3 do not apply to the test findings. When the systolic blood pressure falls by more than 8 mmHg while the heart rate rises by less than 10 beats per minute, a condition known as asymptotic hypotonia takes place. Standing causes a hypotensive reaction because parasympathetic dominance suppresses the vasoconstriction response necessary for postural shifts, rendering blood pressure adjustment ineffective. This occurrence suggests that the autonomic nervous system's capacity to adjust to postural changes is compromised and that blood pressure is high at rest (Trybulski et al., 2025).

In Zone 2a, issues with orthostatic stability are probably due to an early failure of the body's compensatory systems. The presence of asymptotonic hypotonia noted in the Schellong test for individuals with high blood pressure indicates a situation where blood pressure significantly drops when moving from lying down to standing up, caused by an insufficient sympathetic reaction. This condition hinders the body's ability to adjust to different positions, causing systolic and diastolic blood pressure levels to fall below normal, while the heart rate may not respond sufficiently. Such a pattern signifies a problem with the autonomic nervous system, particularly an overactive parasympathetic response or a lack of sympathetic stimulation, which leads to reduced blood flow to the brain. For those with hypertension, recognizing asymptotonic hypotonia is crucial, as poor blood flow responses heighten the likelihood of experiencing orthostatic symptoms like dizziness, fatigue, or fainting. These observations highlight the importance of thorough autonomic assessment and careful management of blood pressure (Palatini et al., 2024).

Meanwhile, Zone 3 is a condition that exceeds the diagnostic criteria for orthostatic hypotension, known as a vasovagal reaction. This response is characterized by a decrease in systolic blood pressure exceeding 8 mmHg and an increase in heart rate exceeding 18 beats per minute. The decreased cerebral blood flow in this condition can result in impaired consciousness (Rivasi & Fedorowski, 2022). This syndrome arises from parasympathetic vagus nerve hypersensitivity, leading to abnormal autonomic reflexes and significant reduction in cerebral perfusion, requiring further evaluation. Zone 3 occurs when an exaggerated autonomic response is characterized by a simultaneous decrease in blood pressure and heart rate due to vagal reflex stimulation during recumbency and lying down. This condition can cause peripheral vasodilation and decreased cardiac output, leading to cerebral hypoperfusion, which can manifest as dizziness, nausea, visual disturbances, and syncope (Suladze et al., 2025). This vasovagal reaction indicates a profound imbalance between sympathetic and parasympathetic nervous activity with parasympathetic dominance (Wieling et al., 2022).

Research results have proven that the Schellong examination can identify changes in orthostatic blood pressure as an early indicator of orthostatic hypotension (Vidal-Petiot et al., 2024). From a nursing perspective, the Schellong test has significant impact as a simple, non-invasive, and easily administered early screening method in various settings, including the community. This test allows nurses to identify patients at risk for dizziness, falls, and fainting before more serious complications occur. With these results, nurses can implement interventions such as education regarding gradual position changes, regular blood pressure monitoring, activity adjustments, and collaboration in evaluating antihypertensive therapy. In terms of efficiency and effectiveness, the Schellong test is considered high because it does not require complicated equipment, is relatively time-consuming, and can be performed by healthcare workers or trained personnel, with results sufficiently accurate for screening.

In the future, this method can be developed into nursing practice through standardized operational procedures integrated into routine care for hypertensive patients. The Schellong test serves not only as a screening tool but also as part of efforts to promote and prevent complications that can occur due to orthostatic hypotension. These findings provide a picture of orthostatic blood pressure changes in hypertensive patients. However, this study certainly has limitations, one of which is that the measurement of orthostatic disturbances using the Schellong test was not complemented by a tilt table test to evaluate the autonomic nervous system's response to changes in body posture. Despite this limitation, the Schellong test offers valuable initial insights into orthostatic detection through a simple examination by assessing blood pressure responses in the lying and standing positions.

CONCLUSION

The Schellong test has been proven to be a simple, non-invasive, and effective method for detecting orthostatic blood pressure changes in hypertensive patients and can be used for early screening of orthostatic hypotension. As a recommendation for nursing practice, nurses are advised to integrate the Schellong test into the routine assessment of hypertensive patients, both in clinical and community settings. The development of a standard operating procedure (SOP) for measuring orthostatic disturbances using the Scellong test is recommended, which is easy to understand and can be easily performed.

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AUTHOR CONTRIBUTION

Conceptualization: NI, Formal analysis, Investigation: NI, MLR, Methodology: NI, NFF, Writing and original draft: NI, MLR, NFF, Writing — review & editing: NI, MLR, NFF

ETHICAL CONSIDERATIONS

The Research Ethics Committee of the Faculty of Health Sciences, Muhammadiyah University of Purwokerto, Faculty of Medicine (KEPK/UMP/68/VIII/2025) approved this research protocol. The purpose and procedures of this study were explained to the respondents, and they were free to withdraw from the research process. All respondents participated voluntarily in this study and signed informed consent.

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CONFLICT OF INTEREST

The authors declare no conflict of interest, financial or otherwise.

DATA AVAILABILITY STATEMENT

The data supporting the findings of this study are not publicly available due to privacy or ethical restrictions. However, they are available from the corresponding author upon reasonable request and with permission from Muhammadiyah University of Purwokerto.

PROTOCOL REGISTRATION

This study is not registered.

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