



**EFFECT OF ISOMETRIC HANDGRIP EXERCISE ON BLOOD PRESSURE IN
HYPERTENSIVE PATIENTS: A CASE STUDY**

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ABSTRACT

Hypertension remains a major global health concern and a leading risk factor for cardiovascular disease. Non-pharmacological interventions play an important role in nursing practice to support blood pressure control. Isometric handgrip exercise has been reported to reduce blood pressure; however, evidence from inpatient clinical settings remains limited. To examine the effect of isometric handgrip exercise on blood pressure in hypertensive patients using a case study approach. A descriptive case study was conducted involving four hypertensive patients admitted to Kultura Ward, 6th Floor, RS UNS. The intervention consisted of isometric handgrip contractions performed for approximately 12 minutes in a single session. Blood pressure was measured before and five minutes after the intervention. Data were analyzed descriptively by comparing pre- and post-intervention values. All patients demonstrated a reduction in systolic blood pressure, with a mean decrease of 13.25 mmHg (range 12–16 mmHg). Diastolic changes varied; three patients experienced reductions of 2–5 mmHg, while one patient showed a 6 mmHg increase. Isometric handgrip exercise shows potential as a simple and applicable non-pharmacological intervention to reduce systolic blood pressure in hypertensive patients.

Keywords: blood pressure; hypertension; isometric handgrip exercise; nursing intervention

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INTRODUCTION

Hypertension remains a significant public health problem globally and nationally. The World Health Organization reported that more than one billion people worldwide are living with hypertension, with the majority residing in low- and middle-income countries (WHO, 2023). In Indonesia, the 2022 National Health Survey indicated that the prevalence of hypertension among adults aged ≥ 18 years exceeds 30%, with an increasing trend with age (Ministry of Health of the Republic of Indonesia, 2022). Furthermore, the 2023 Indonesian Health Profile identified hypertension as one of the top ten most common diseases in primary healthcare facilities (Ministry of Health of the Republic of Indonesia, 2023). This condition requires serious attention, as hypertension is a primary risk factor for stroke, coronary heart disease, renal failure, and premature mortality.

Clinically, hypertension is defined as systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg based on repeated measurements under resting conditions (International Society of Hypertension [ISH], 2020). Persistent elevation of blood pressure leads to structural and functional vascular changes, including increased peripheral resistance and arterial stiffness. Activation of the sympathetic nervous system and the renin–angiotensin–aldosterone system contributes to sustained vasoconstriction and fluid retention, thereby maintaining elevated blood pressure levels (McGowan et al., 2021). Hypertension management aims to achieve optimal blood pressure targets to prevent cardiovascular complications. Recommended approaches include

pharmacological therapy combined with lifestyle modification. Regular physical activity, dietary salt restriction, weight control, smoking cessation, and stress management have been shown to effectively support blood pressure reduction (WHO, 2023; ISH, 2020). Within nursing practice, non-pharmacological interventions are particularly valuable as they promote patient self-management and strengthen preventive strategies.

Recent Indonesian studies further reinforce the importance of structured non-pharmacological approaches. Febiola and Purwanti (2025) reported that alternate nostril breathing reduced systolic blood pressure by 7–39 mmHg and diastolic blood pressure by 4–15 mmHg among hypertensive patients, emphasizing the role of parasympathetic activation in vascular relaxation. Similarly, Tias and Purwanti (2024) demonstrated that foot reflexology administered for 10–15 minutes twice daily over three consecutive days produced measurable blood pressure reductions in hospitalized hypertensive patients, likely mediated by relaxation-induced improvements in peripheral circulation. In more complex clinical contexts, Purwanti et al. (2024) found that intradialytic exercise significantly reduced systolic ($p = 0.001$) and diastolic ($p = 0.004$) blood pressure among patients with CKD stage V undergoing hemodialysis. Collectively, these findings suggest that simple, structured, and low-cost therapeutic interventions can yield clinically meaningful hemodynamic benefits, even in medically vulnerable populations.

Beyond physiological regulation, blood pressure control is also influenced by behavioral and psychosocial dimensions. Ayunarwanti and Maliya (2020) identified a significant relationship between self-efficacy and intradialytic hypertension, indicating that patients with lower confidence in self-care abilities were more likely to experience blood pressure instability. Additionally, Supratman (2021) highlighted that uncontrolled hypertension negatively affects quality of life, particularly in social functioning and psychological well-being. These findings underline that hypertension management should not be limited to numerical targets but should also aim to enhance patients' functional capacity and overall well-being. In addition to individual psychological factors, community-based educational interventions also play a crucial role in improving hypertension management. A study conducted among elderly populations in Indonesia demonstrated that structured health education combined with physical activity significantly improved participants' knowledge regarding hypertension ($p < 0.05$) (Rizki et al., 2024). These findings highlight the importance of integrating promotive strategies into hypertension control programs. Furthermore, effective hypertension management requires not only clinical and physiological interventions but also sustained efforts to enhance patient awareness and health literacy.

Among various physical interventions, isometric handgrip exercise has emerged as a simple and promising modality. This intervention involves static muscle contraction using a handgrip device without substantial joint movement, making it practical and accessible. A meta-analysis by Smart et al. (2022) demonstrated that isometric resistance training consistently reduces systolic blood pressure by approximately 6–8 mmHg in hypertensive individuals. Edwards et al. (2023) further reported that handgrip training is effective as an adjunct therapy in both controlled and uncontrolled hypertension. In Indonesia, Nanda et al. (2024) documented significant reductions in blood pressure among elderly patients after five days of isometric handgrip exercise, while Yendrial and Deski (2025) observed statistically significant decreases in systolic and diastolic pressure following a 10-day intervention ($p < 0.05$). Rahayu and Hermawati (2024) also reported favorable blood pressure changes in a primary care case study.

Physiologically, repeated isometric contractions increase shear stress on the vascular endothelium, stimulating nitric oxide production and improving endothelial function. This process enhances vasodilation and arterial compliance while potentially reducing sympathetic activity and improving baroreflex sensitivity (McGowan et al., 2021). The simplicity, affordability, and minimal time requirement of isometric handgrip exercise make it highly applicable in both community and

clinical settings. Despite accumulating evidence, studies examining acute hemodynamic responses within inpatient nursing practice remain limited. Most existing research focuses on longer intervention periods or community-based settings. A descriptive case study conducted in an inpatient environment may provide deeper insight into immediate blood pressure responses and clinical feasibility. Therefore, this study aimed to examine the effect of isometric handgrip exercise on blood pressure among hypertensive patients through a descriptive case study conducted in an inpatient setting.

METHOD

This study employed a descriptive case study design to explore the effect of isometric handgrip exercise on blood pressure changes in hypertensive patients. Four patients diagnosed with hypertension who met the inclusion criteria participated in the study. Participants were selected using a purposive sampling technique, in which subjects were intentionally recruited based on specific characteristics relevant to the study objectives. This technique was chosen to ensure that all participants met the predefined clinical criteria and were able to complete the intervention safely and consistently. Inclusion criteria were systolic blood pressure ≥ 140 mmHg and/or diastolic blood pressure ≥ 90 mmHg, age ≥ 45 years, ability to grip the handgrip device independently, and willing to participate. Exclusion criteria included upper extremity musculoskeletal disorders, carpal tunnel syndrome, hand pain, or any condition limiting isometric exercise performance. Written informed consent was obtained from all participants before enrollment in the study, following a comprehensive explanation of the study purpose, procedures, potential risks, and participants' rights. The intervention utilized a handgrip device and a sphygmomanometer for blood pressure measurement. Blood pressure was assessed in a seated position after a five-minute rest period to ensure measurement consistency. Patients performed moderate-intensity handgrip contractions for approximately two minutes, followed by one minute of rest. The exercise was performed on both hands alternately. Four contractions were completed per hand, resulting in a total of eight contractions per session, with an overall duration of approximately 12 minutes. Five minutes after completing the intervention, blood pressure was re-measured using the same standardized procedure. Data were analyzed descriptively by comparing pre- and post-intervention blood pressure values for each participant.

RESULT

The study was conducted at RS UNS, Kultura Ward, 6th Floor, involving four hypertensive patients who met the inclusion criteria. The characteristics of the participants are presented in Table 1.

Table 1.

Respondent characteristics (n= 4)

Variable	Patient 1	Patient 2	Patient 3	Patient 4
Initials	S	I	G	K
Age	49	58	69	47
Sex	Female	Female	Male	Female
Occupation	Housewife	Lawyer	Entrepreneur (Retail)	Self-employed

The majority of participants were female (75%), with an age range of 47–69 years. Two participants were aged ≥ 55 years, an age group physiologically associated with increased arterial stiffness and elevated peripheral vascular resistance.

Table 2.

Pre- and Post-Intervention Blood Pressure Measurements (n = 4)

Patient	Blood Pressure		Δ SBP (mmHg)	Δ DBP (mmHg)
	Before (mmHg)	After (mmHg)		
Patient 1	163/86	147/92	-16	+6
Patient 2	162/104	150/99	-12	-5
Patient 3	156/92	143/90	-13	-2
Patient 4	156/96	144/93	-12	-3
Mean Change	—	—	-13.25	-1.00

*SBP = systolic blood pressure; DBP = diastolic blood pressure; Δ = mean difference (post–pre)

These characteristics may contribute to baseline systolic predominance commonly observed in older hypertensive patients. Blood pressure measurements obtained before and after the isometric handgrip exercise intervention are summarized in table 2. Based on table 2, all participants demonstrated a reduction in systolic blood pressure following a single session of isometric handgrip exercise. The systolic decrease ranged from 12 to 16 mmHg, with a mean reduction of 13.25 mmHg. This corresponds to an approximate 8–10% reduction from baseline systolic values.

In contrast, diastolic blood pressure responses were more variable. The mean diastolic change was -1.00 mmHg; three participants experienced modest reductions of 2–5 mmHg, whereas one participant exhibited a 6 mmHg increase. Overall, the systolic component showed a more consistent and clinically meaningful acute response compared with the diastolic component. These findings indicate that isometric handgrip exercise may exert a more immediate effect on arterial compliance and systolic load, supporting its potential role as a practical non-pharmacological intervention in inpatient hypertensive care.

DISCUSSION

This study demonstrated that a single session of isometric handgrip exercise produced a consistent reduction in systolic blood pressure among hypertensive patients, with a mean decrease of 13.25 mmHg. This magnitude exceeds the 6–8 mmHg reduction commonly reported in meta-analyses of isometric resistance training and may reflect the acute hemodynamic response observed immediately after intervention, as well as individual variability within a small sample. Importantly, reductions of ≥ 10 mmHg in systolic blood pressure have been associated with meaningful decreases in cardiovascular risk (ISH, 2020), underscoring the potential clinical relevance of the observed change.

The more pronounced systolic response may be explained by improved arterial compliance and enhanced endothelial function mediated through nitric oxide release following repeated isometric contraction. Because systolic pressure is strongly influenced by large-artery stiffness, even modest improvements in vascular elasticity may be more rapidly reflected in systolic values than in diastolic pressure (McGowan et al., 2021).

In contrast, diastolic responses were more heterogeneous. This variability may be attributable to transient sympathetic activation and increased peripheral vascular resistance during or immediately after isometric contraction, prior to the development of longer-term vascular adaptations (McGowan et al., 2021). Previous meta-analyses have also reported less consistent diastolic reductions compared to systolic responses following isometric handgrip training (Smart et al., 2022). Psychological influences during measurement and individual biological variability may further contribute to these findings. Given the small sample size, such interindividual variation becomes more prominent.

The findings of this study are in line with previous evidence supporting the antihypertensive effect of isometric handgrip exercise. Ardiansyah, Widiharti, et al. (2025) reported significant reductions in blood pressure in the intervention group compared with controls, indicating that structured isometric contraction produces measurable cardiovascular responses. Similarly, Permata Sari et al. (2024) and Aisah and Rejeki (2021) demonstrated that short-term handgrip training protocols were sufficient to elicit statistically significant decreases in blood pressure. These findings reinforce that even relatively brief and simple muscle contraction exercises can generate clinically relevant hemodynamic effects.

Comparable results were also reported by Nanda et al. (2024), who observed more pronounced reductions in systolic pressure among elderly hypertensive patients following repeated handgrip sessions. Yendrial and Deski (2025) documented significant decreases in both systolic and diastolic

pressure after a 10-day intervention, while Rahayu and Hermawati (2024) confirmed the feasibility and effectiveness of this intervention within a primary care case-study framework. Collectively, these national findings suggest that isometric handgrip exercise consistently contributes to blood pressure reduction across different age groups and healthcare settings.

International evidence further strengthens these observations. Smart et al. (2022), through a meta-analysis, demonstrated consistent reductions in resting systolic blood pressure following isometric resistance training, with comparatively smaller and less consistent effects on diastolic pressure. Edwards et al. (2023) similarly concluded that handgrip exercise serves as an effective adjunct therapy in both controlled and uncontrolled hypertension. The pattern observed in the present study more consistent systolic reduction with greater variability in diastolic response therefore aligns with broader international trends.

However, an important distinction should be noted. Most previous studies assessed outcomes after repeated interventions over days or weeks, emphasizing chronic vascular adaptation. In contrast, the present study focuses on acute hemodynamic responses observed after a single exercise session within an inpatient setting. This perspective adds practical value, as hospitalized patients often require interventions that are safe, efficient, and immediately applicable. The observation that measurable systolic reductions can occur acutely suggests that isometric handgrip exercise may provide early vascular benefits even before longer-term adaptations develop.

Several limitations should be acknowledged, including the absence of a control group and the lack of long-term follow-up. Consequently, the findings should be interpreted cautiously. However, the results suggest that a simple and structured isometric handgrip protocol may induce measurable short-term hemodynamic changes and could serve as a feasible adjunctive strategy in clinical nursing practice.

CONCLUSION

A single session of isometric handgrip exercise consistently reduced systolic blood pressure in hypertensive patients, with a mean reduction of 13.25 mmHg. This magnitude of change is clinically relevant and may contribute to cardiovascular risk reduction. Although diastolic responses varied, the intervention appears safe, simple, and feasible in clinical nursing practice.

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