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CORRELATION BETWEEN HEMODYNAMIC STATUS AND EMERGENCY RISK AMONG OLDER ADULTS WITH HYPERTENSION IN CAMPURDARAT

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ABSTRACT
Hypertension in older adults is a major health concern that can alter hemodynamic status and increase the risk of cardiovascular emergencies. Early detection through hemodynamic monitoring is needed to prevent more serious complications. This study aims to analyze the correlation between hemodynamic status and emergency risk among older adults with hypertension. This study employs a used a cross-sectional analytic design and was conducted in April 2026 in Campurdarat Village. A total of 32 older adults with hypertension were selected through purposive sampling. The independent variable was hemodynamic status, comprising blood pressure, mean arterial pressure (MAP), pulse rate, oxygen saturation, and capillary refill time (CRT); the dependent variable was emergency risk. Data were analyzed using the Spearman rank correlation test. Most respondents had stable hemodynamics (78%) and a low emergency risk (59%). Thirty-eight percent had high systolic blood pressure, 53% had MAP values in the moderate-to-high risk category, and 41% had an abnormal CRT. The Spearman test revealed a strong and significant correlation between hemodynamic status and emergency risk ($r = 0.640$; $p < 0.001$Hemodynamic status is significantly associated with emergency risk among older adults with hypertension. Comprehensive hemodynamic assessment is therefore essential for the early detection and prevention of emergency complications.

Keywords: emergency risk; hemodynamics; hypertension; older adults

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INTRODUCTION

Hypertension is a non-communicable disease that remains a global public health problem. Often called the "*silent killer*," it frequently produces no symptoms in its early stages, yet it can lead to serious complications such as stroke, coronary heart disease, heart failure, and kidney failure. The World Health Organization reports that hypertension is still a leading risk factor for death and disability from cardiovascular disease (Matsui et al., 2022). In Indonesia, hypertension is one of the main contributors to rising morbidity and mortality, particularly among older adults (Kementrian Kesehatan RI, 2024). Older adults are at high risk of developing hypertension because hormonal and biochemical factors play an important role in its onset (Yuderna et al., 2023). Hormonal changes can increase relative androgen levels, renin, plasma endothelin, salt sensitivity, insulin resistance, sympathetic activity, and body weight, all of which ultimately lead to hypertension (Oscar Ari Wiryansyah 1, 2025).

According to the World Health Organization, approximately 1.28 billion adults worldwide have hypertension, and nearly two-thirds of them live in low- and middle-income countries (World Health Organization, 2021). Hypertension, or high blood pressure, is the leading cause of death worldwide, with essential hypertension accounting for 90–95% of cases. In Indonesia, the 2023 Indonesian Health Survey (*Survei Kesehatan Indonesia*, SKI) and the 2011–2021 non-

communicable disease cohort study identified hypertension as the fourth-highest risk factor for death, accounting for 10.2% of deaths (Ministry of Health of the Republic of Indonesia, 2024). The burden of hypertension is greater among older adults than in any other age group. An analysis of SKI 2023 data showed that more than half of Indonesia's older population has hypertension, and the Ministry of Health's 2026 Free Health Check (*Cek Kesehatan Gratis*) program likewise found that 63.5% of the older adults screened were hypertensive (Prasetyo, 2023.)

Aging brings a range of physiological changes to the cardiovascular system, including reduced arterial elasticity, increased peripheral resistance, and a diminished capacity of the heart to maintain optimal tissue perfusion. These changes make older adults more vulnerable to hemodynamic disturbances, which manifest as alterations in blood pressure, pulse rate, peripheral perfusion, and overall circulatory balance. If they are not detected early, such disturbances can lead to cardiovascular instability that may progress to an emergency (Ballenger et al., 2021)

These high figures indicate that hypertension in older adults remains a priority health problem that requires sustained prevention and control efforts (Anis Murniati et al., 2025; Prasetyo, 2023.) Long-standing hypertension can cause hemodynamic changes that impair the perfusion of vital organs. Changes in hemodynamic parameters—such as elevated systolic blood pressure, increased mean arterial pressure (MAP), altered pulse rate, and impaired peripheral perfusion—may serve as early indicators of a cardiovascular emergency (Lian et al., 2021). Beberapa kondisi yang sering muncul akibat ketidakstabilan hemodinamik pada lansia hipertensi antara lain krisis hipertensi, stroke, gagal jantung akut, sindrom koroner akut, hingga penurunan kesadaran akibat gangguan perfusi serebral (Ballenger et al., 2021). Conditions that commonly arise from hemodynamic instability in older adults with hypertension include hypertensive crisis, stroke, acute heart failure, acute coronary syndrome, and decreased consciousness due to impaired cerebral perfusion (Ballenger et al., 2021). Monitoring hemodynamic parameters is therefore an essential component of the early detection of cardiovascular emergency risk (Lian et al., 2021).

Nurses play a vital role in screening, monitoring, and educating older adults with hypertension about hemodynamic changes. In addition, community-based approaches are considered more effective in raising public awareness of the importance of controlling hypertension and preventing cardiovascular complications. Cardiovascular disease (CVD), which includes heart attack, stroke, and other vascular disorders, is one of the leading causes of death worldwide, including in Indonesia, and contributes substantially to the global public health burden (Yuderna et al., 2023). Given the high prevalence of hypertension among older adults and the considerable risk of cardiovascular complications arising from hemodynamic changes, research on the correlation between hemodynamic status and emergency risk in this population is needed. This study was expected to shed light on the relationship between hemodynamic status and emergency risk among older adults with hypertension, thereby providing a basis for developing community-based screening programs to reduce the incidence of cardiovascular emergencies among older adults in the Campurdarat Tulungagung.

METHOD

This quantitative study employed a cross-sectional analytic design and was conducted in April 2026 in Campurdarat Village. The study population comprised all older adults with hypertension residing in Campurdarat Village, from which 32 respondents were selected through purposive sampling based on predetermined inclusion and exclusion criteria. The inclusion criteria were: (1) aged ≥ 60 years; (2) a history of hypertension or a blood pressure of ≥ 140/90 mmHg; (3) willingness to participate as a respondent; and (4) ability to communicate well. The exclusion criteria were: (1) severe cognitive impairment; (2) an emergency condition at the time of data collection; and (3) inability to complete the full examination. The independent variable was hemodynamic status, and the dependent variable was cardiovascular emergency risk. Hemodynamic status was recorded

using an observation sheet covering blood pressure, pulse rate, MAP, oxygen saturation, and CRT, whereas emergency risk was assessed using a questionnaire.

RESULT

Table 1.
Respondent Characteristics by Sex (n = 32)

Sex	f	%
Female	30	94
Male	2	6

As shown in Table 1, the vast majority of respondents were female (94%).

Table 2.
Hemodynamic Status and Emergency Risk of Respondents (n = 32)

Variable	f	%
Systolic blood pressure		
Normal	14	44
Elevated	6	19
High	12	38
Diastolic blood pressure		
Normal	22	69
Elevated	9	28
High	1	3
Mean arterial pressure (MAP)		
Normal	15	47
Moderate risk	11	34
High risk	6	19
Pulse rate		
Normal	32	100
Abnormal	0	0
Oxygen saturation		
Normal	31	97
Abnormal	1	3
Capillary refill time (CRT)		
Normal (≤ 2 seconds)	19	59
Abnormal (> 2 seconds)	13	41
Overall hemodynamic status		
Stable	25	78
Moderate disturbance	7	22
Severe disturbance	0	0
Emergency risk		
Low	19	59
Moderate	13	41
High	0	0

Table 2 shows that the largest proportion of respondents had normal systolic blood pressure (44%), and most had normal diastolic blood pressure (69%). Nearly half of the respondents had a MAP within the normal category (47%). All respondents had a normal pulse rate (100%), and almost all had normal oxygen saturation (97%). Regarding peripheral perfusion, 59% of respondents had a normal capillary refill time (CRT). Overall, most respondents were hemodynamically stable (78%) and had a low emergency risk (59%).

Table 3.
Spearman Rank Correlation between Hemodynamic Status and Emergency Risk

Variables	n	Correlation coefficient (r)	p-value
Hemodynamic status – Emergency risk	32	0.640	< 0.001

As presented in Table 3, the Spearman rank test yielded a correlation coefficient of 0.640 with a p-value < 0.001 ($p < 0.05$). Therefore, H1 was accepted, indicating a strong and significant correlation between hemodynamic status and emergency risk among older adults with hypertension.

DISCUSSION

In this study, 38% of respondents had high systolic blood pressure, whereas most (69%) had diastolic blood pressure within the normal range. This suggests that elevated systolic pressure is a more prominent problem than elevated diastolic pressure among older adults with hypertension. Aging has a direct effect on the blood vessels: over time, the elastin fibers in the arterial wall degenerate and are replaced by stiffer collagen tissue. This stiffening reduces the ability of the arteries to expand as they receive blood from the heart, which in turn raises systolic pressure. For this reason, isolated systolic hypertension is common in later life and is regarded as a hallmark of hypertension in older adults (Park et al., 2021). Viewed in light of this theory, the high proportion of elevated systolic pressure in our sample suggests that many respondents had already undergone long-term, age-related vascular changes. This deserves attention, as high systolic pressure is associated with an increased risk of stroke, heart failure, and other cardiovascular diseases.

That said, blood pressure management in older adults should not focus solely on lowering systolic pressure. This is reflected in our finding that most respondents still had normal diastolic pressure. Diastolic pressure plays a key role in maintaining coronary blood flow, which supplies the heart muscle while the heart relaxes. Several studies have described a J-curve phenomenon, in which an excessively low diastolic pressure actually increases the risk of cardiovascular disease and impaired perfusion of vital organs. The lesson here is that hypertension in older adults must be managed carefully: lowering blood pressure too aggressively can compromise tissue perfusion and trigger complications that ultimately harm the patient. Balancing systolic pressure control with the maintenance of adequate diastolic pressure should therefore be a central consideration in clinical practice.

The results also showed that, based on MAP, 34% of respondents were in the moderate-risk category and 19% were in the high-risk category, meaning that more than half had suboptimal MAP values. MAP is an important indicator that reflects the average pressure within the arterial system over one cardiac cycle and is a primary determinant of adequate organ perfusion. Vital organs such as the brain, heart, and kidneys depend heavily on adequate perfusion pressure to function normally. When MAP falls or moves outside its optimal range, the delivery of oxygen and nutrients to tissues can be disrupted, increasing the risk of hypoperfusion (Chrysant & Chrysant, 2014). In our view, the large proportion of respondents with moderate- and high-risk MAP values points to a substantial potential for impaired organ perfusion among older adults with hypertension. This risk becomes even more serious when comorbidities such as diabetes mellitus, heart disease, or kidney disorders are present. MAP monitoring is therefore particularly valuable, as it provides a more comprehensive picture of circulatory status than systolic or diastolic pressure considered separately.

With regard to peripheral perfusion, 41% of respondents had a CRT longer than 2 seconds, even though all of them had a normal pulse rate. This indicates that impaired peripheral perfusion can occur even when conventional vital signs appear stable. CRT is a simple indicator used to assess the adequacy of blood flow in the peripheral circulation. A prolonged capillary refill time signals impeded microcirculatory flow, which is often caused by increased systemic vascular resistance. In older adults with hypertension, structural changes in the blood vessels increase vascular stiffness and impede blood flow to peripheral tissues (Xiajuan et al., 2013a). Interpreted in this context, the high proportion of abnormal CRT values suggests that some respondents may already have been experiencing early-stage impairment of tissue perfusion. This finding calls for vigilance, because changes in CRT often appear before changes in blood pressure or pulse rate. CRT can thus serve as a simple yet highly useful indicator for detecting hemodynamic instability in older adults with hypertension.

All respondents had a normal pulse rate, and nearly all (97%) had normal oxygen saturation. At face value, these findings could be interpreted as a sign of physiological stability. However, gerontological theory holds that aging diminishes the compensatory capacity of the cardiovascular system. In addition, antihypertensive drugs such as beta-blockers can blunt the heart rate response when the body is under physiological stress or experiencing impaired perfusion (Park et al., 2021). We believe this explains why normal pulse and oxygen saturation values do not always reflect a truly safe circulatory state in older adults. In other words, older adults may experience impaired perfusion or hemodynamic instability without any obvious changes in their basic vital signs. Clinical assessment should therefore be holistic and take a broader range of hemodynamic parameters into account.

This study also found that 41% of respondents were at moderate emergency risk. In other words, nearly half of the older adults with hypertension had the potential to develop conditions that could escalate into an emergency without appropriate monitoring and management. Monitoring older adults relies heavily on nurses, who must detect changes in a patient's condition quickly and accurately so that interventions can be delivered promptly before deterioration occurs (Intan et al., 2025) . Hemodynamic disturbances can reduce cerebral perfusion, leading to dizziness, impaired balance, syncope, and falls. Falls are among the most frequent emergencies in older adults, as they can result in fractures, head injuries, reduced quality of life, and even death. Moreover, older adults with hypertension have a different tolerance threshold for changes in blood pressure. A drop in systolic pressure to around 110 mmHg, which is still considered normal for many adults, may cause impaired perfusion in older people who have long adapted to high blood pressure (Zhang et al., 2024) This explains why older adults with hypertension require closer monitoring than other age groups. Vigilance is needed not only when blood pressure is very high but also when it falls, even slightly, because such changes may be an early sign of hemodynamic instability that could progress to an emergency.

The analysis revealed a strong and statistically significant correlation between hemodynamic status and emergency risk among older adults with hypertension ($r = 0.640$; $p < 0.001$). This finding highlights the important role that hemodynamic status plays in determining how vulnerable older adults are to emergencies. Those with more stable hemodynamics tended to have a lower emergency risk, whereas those with hemodynamic disturbances were more likely to develop acute complications requiring immediate treatment. Theoretically, hemodynamic status reflects the ability of the cardiovascular system to maintain tissue perfusion and meet the oxygen and nutrient demands of vital organs. In older adults with hypertension, aging alters the structure and function of the blood vessels, weakening the body's ability to maintain circulatory stability. As a result, even small changes in hemodynamic parameters can have a greater impact than they would in younger individuals ((Xiajuan et al., 2013b); (Zhang et al., 2024);(Wiersinga et al., 2025). In our view, these results show that hemodynamic assessment does more than capture a patient's condition at the time of examination; it can also serve as an early indicator for predicting emergencies. Put differently, hemodynamic disturbances in older adults with hypertension should be regarded as early warning signs that warrant particular attention from health professionals.

Overall, the findings of this study show that the relationship between hemodynamic status and emergency risk in older adults with hypertension is complex and interdependent. Abnormalities in parameters such as blood pressure, MAP, and CRT may offer early clues to declining tissue perfusion even when the pulse rate and oxygen saturation still appear normal. These findings underscore the importance of comprehensive hemodynamic assessment in nursing practice and in health services for older adults. Early detection of changes in hemodynamic status can help prevent more serious complications and improve the safety and quality of life of older adults with hypertension.

CONCLUSION

There is a strong and significant correlation between hemodynamic status and emergency risk among older adults with hypertension ($r = 0.640$; $p < 0.001$): the less stable the hemodynamic status, the higher the risk of an emergency. This finding is supported by the considerable proportion of respondents with elevated systolic pressure, MAP values in the moderate-to-high risk category, and a prolonged capillary refill time (CRT), even though vital signs such as pulse rate and oxygen saturation were largely normal. This indicates that impaired perfusion can develop silently. Hemodynamic status therefore proves to be an important indicator for the early detection of emergency risk in older adults with hypertension.

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