



Hypertension as a Determinant of Elevated Stress Among Hajj Pilgrims: A Cross-Sectional Study

Faridj Maulana Amir¹, Elman Boy², Ahmad Handayani³, Nurhasanah⁴

¹Faculty of Medicine, Universitas Muhammadiyah Sumatera Utara, Medan, Indonesia

²Department of Public Health, Faculty of Medicine, Universitas Muhammadiyah Sumatera Utara, Medan, Indonesia.

³Department of Cardiology, Faculty of Medicine, Universitas Muhammadiyah Sumatera Utara, Medan, Indonesia.

⁴Department of Psychiatry, Faculty of Medicine, Universitas Muhammadiyah Sumatera Utara, Medan, Indonesia.

Corresponding Author : Faridj Maulana Amir

Email : faridjmaulana@gmail.com

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ABSTRACT

Introduction: The Hajj pilgrimage involves physically and mentally demanding rituals under extreme conditions, including heat, crowding, and long travel, which can increase psychological stress. Hypertension may worsen this stress due to higher risk of complications and altered stress responses. This study aimed to evaluate hypertension as a determinant of stress among Hajj pilgrims in Medan in 2024. **Methods:** An analytic cross-sectional study was conducted on 56 pilgrims, divided into two groups: 28 with hypertension and 28 without. Stress levels were measured using the Perceived Stress Scale (PSS-10) and analyzed using the chi-square test. **Results:** There was a significant association between hypertension and stress levels ($p < 0.05$). Pilgrims with hypertension had higher stress levels compared to those without hypertension. **Discussion:** Hypertension is associated with increased stress among Hajj pilgrims. Concerns about health risks during demanding rituals may heighten psychological burden. Proper hypertension management and psychological support before and during Hajj are important to reduce stress and improve pilgrims' well-being.

Keywords : Hajj, Hypertension, Levels, Stress

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INTRODUCTION

Stress is one of the most common mental health problems in Indonesia. According to the Indonesian Basic Health Research, more than 19 million Indonesians aged over 15 years experience emotional mental disorders, and more than 12 million people suffer from depression (Basrowi et al., 2024). According to Nusran (2019), stress is an internal state arising from physical demands, environmental pressures, and social situations that may be potentially harmful and beyond an individual's control (Mardiani et al., 2022). Stress can arise in any condition, including during the performance of the Hajj pilgrimage.

Hajj is the fifth pillar of Islam. It consists of a series of complex religious rituals performed in accordance with Islamic regulations, including ihram, wuquf in Arafah, tawaf, sa'i, tahallul, and other rites (Mahrusillah, 2025). The pilgrimage is conducted once a year with a continuously rotating group of pilgrims, long waiting periods, and is performed in a climate that is often unfamiliar to Indonesian pilgrims. Considering the complexity of the pilgrimage and the various challenges faced, Hajj has the potential to trigger stress among pilgrims.

Pilgrims may experience stress during the Hajj due to multiple factors. These include physical exhaustion from continuous activities, hot weather, and pre-existing health conditions such as hypertension, diabetes, and other chronic diseases. From a psychological perspective, pilgrims may experience homesickness and social pressure to perform the rituals perfectly. Long travel duration, time zone changes, and uncomfortable accommodation may further increase stress levels. In addition, overcrowding during the pilgrimage rituals frequently occurs and can significantly intensify stress among pilgrims (Parker et al., 2024).

Apart from the Hajj-related activities that may induce stress, other factors such as degenerative diseases also play a role in worsening the mental health of Indonesian pilgrims, one of which is hypertension. Hypertension remains a major public health concern in Indonesia. In 2023, the World Health Organization reported that more than 51 million Indonesians aged 30 to 79 years were living with hypertension (Khasanah & Airlangga, 2022). Hypertension, or high blood pressure, is a medical condition defined by a systolic blood pressure of ≥ 140 mmHg and/or a diastolic blood pressure of ≥ 90 mmHg (Mi et al., 2024).

Not all pilgrims experience hypertension, and individuals may respond differently to stressors. Based on research describing anxiety levels among patients with hypertension, hypertensive individuals tend to feel more anxious due to concerns that their condition may worsen or lead to complications (Oliveira et al., n.d.). These findings suggest that pilgrims with hypertension have a higher probability of experiencing increased stress during the Hajj pilgrimage. High stress levels among pilgrims may lead to deterioration in health status, thereby increasing the risk of morbidity and mortality. A study conducted by the Faculty of Medicine, Universitas Indonesia, in 2019 reported that out of 659 Indonesian pilgrims who died in 2017, 292 deaths were caused by cardiovascular diseases. The main risk factors included age over 60 years (76.7%), hypertension (53.4%), obesity (37.3%), and late-departure travel waves (53%) (Rahman, 2024). Furthermore, data from the Hajj Information and Computerization System (SISKOHAT) showed that approximately 773 Indonesian pilgrims died in Saudi Arabia in 2023 (Hashifah, 2024). This situation has drawn significant attention from various stakeholders to identify contributing factors and implement optimal interventions to reduce mortality among Indonesian pilgrims.

To date, no study has specifically examined differences in stress levels between pilgrims with hypertension and those without hypertension. Previous research supporting this study analyzed risk

factors for hypertension among pilgrims from the Makassar embarkation, showing that unhealthy dietary habits, lack of physical activity, and excessive stress significantly contributed to hypertension incidence (Ananda et al., 2021). Another supporting study examined the occurrence of stress among tourists undertaking long-distance travel and reported that long travel distances and frequent changes in location may increase the risk of stress-related disorders. Such conditions indicate that physically and environmentally demanding travel situations can contribute to psychological stress, particularly among individuals with underlying health conditions. (Maulitya et al., 2025). Based on these findings, the present study aims to determine whether there is a difference in stress levels between hypertensive and non-hypertensive Hajj pilgrims in Medan City in 2024 using a validated measurement instrument.

The novelty of this study lies in its examination of hypertension as a determinant of elevated stress levels among Hajj pilgrims using a validated stress measurement instrument within a defined local population in Medan City in 2024. Unlike previous studies that primarily focused on hypertension risk factors or travel-related stress independently, this study integrates both medical and psychological dimensions within the specific context of the Hajj pilgrimage. By assessing the association between hypertension status and stress levels among Indonesian pilgrims, this study provides additional evidence regarding the potential role of chronic medical conditions in influencing psychological vulnerability during physically and emotionally demanding religious activities.

METHODS

Data Collection Technique

This study used primary data collected directly by the researcher from eligible Hajj pilgrims from Medan City in 2024. The target population included 136 pilgrims with hypertension and 638 pilgrims without hypertension or other chronic diseases. Sample size was calculated using the comparative formula for two samples, resulting in 28 respondents per group (hypertensive and non-hypertensive). Simple random sampling was employed to select participants from the defined population.

Inclusion criteria were: (1) registered Hajj pilgrims from Medan City in 2024, and (2) willingness to participate. Exclusion criteria included: (1) comorbid conditions other than hypertension, such as diabetes mellitus, coronary heart disease, stroke, cancer, chronic obstructive pulmonary disease, asthma, renal failure, gastrointestinal disorders, or other chronic pain conditions.

Data were collected using a structured Google Form distributed to selected respondents. The questionnaire included informed consent, personal identification (name, age, address, occupation), history of physician-prescribed antihypertensive medication, and stress assessment. Stress levels were measured using the Perceived Stress Scale–10 (PSS-10), a validated 10-item instrument that has demonstrated acceptable psychometric properties in the Indonesian population (Erlena et al., 2025).

Ethical approval for the study was obtained from the Institutional Review Board (ethics committee) of FK UMSU (Approval No.1308/KEPK/FKUMSU/2024). All participants provided written informed consent before participation.

Data Analysis

The collected data were analyzed using univariate analysis through frequency distribution tables to describe the distribution of each studied variable. Subsequently, bivariate analysis was conducted to compare two independent categorical variables using the chi-square statistical test with SPSS (Statistical Product and Service Solutions) software (Miola, 2022).

If the assumptions for the chi-square test were not met (i.e., no expected cell value < 1 and no more than 20% of cells with expected values < 5), Fisher's Exact Test was used as an alternative statistical method.

RESULTS AND DISCUSSION

This study was conducted following approval from the Ethics Committee (reference number: 1308/KEPK/FKUMSU/2024). It was an analytical study with a cross-sectional design aimed at evaluating hypertension as a determinant of stress levels among Hajj pilgrims in Medan City in 2024. The study was conducted between September and November 2024 and involved a total of 56 Hajj pilgrims as participants.

Demographic Data of Hajj Pilgrims in Medan City in 2024 The demographic characteristics of the respondents are presented based on gender and age.

Table 1. Frequency Distribution of Respondents by Gender and Age

Gender	n	%	Age	n	%
Male	31	55,4	Adults (19-59 years)	43	76,8
Female	25	44,6	Elderly (≥ 60 years)	13	23,2
Total	56	100 %	Total	56	100%

Based on the table above, the total number of respondents was 56, consisting of 31 male respondents (55.4%) and 25 female respondents (44.6%). From these data, it can be seen that male hajj pilgrims were more numerous than female pilgrims in completing the questionnaire. The frequency distribution of adult hajj pilgrims who participated as respondents was 43 people (76.8%), while elderly respondents accounted for 13 people (23.2%). It can be concluded that adult respondents was greater than elderly respondents.

Distribution of Hypertension History Among Hajj Pilgrims in Medan City in 2024 by Gender and Age.

Table 2. Distribution of Hypertension History Among Hajj Pilgrims in Medan City in 2024 by Gender and Age

Hypertension History	Gender		Age Group		Total
	Male	Female	Adults (19 - 59)	Elderly (60 ≥)	
Has Hypertension	16	12	17	11	28
No Hipertension	15	13	26	2	28
Total	31	25	43	13	56 (100%)

Based on the total sample in the table above, 17 adults (30.36%) and 11 elderly pilgrims (19.64%) had hypertension, while 26 adults (46.43%) and 2 elderly (3.57%) did not. These findings indicate that hypertension was more common among elderly pilgrims, whereas the majority of adults were not hypertensive. Based on gender, 16 men (28.57%) and 12 women (21.43%) had hypertension, while 15 men (26.79%) and 13 women (23.21%) did not. This shows that the proportion of men with hypertension was slightly higher than those without, while among women the majority were not hypertensive.

This section begins by describing the proportion of Hajj pilgrims in Medan City in 2024 with a history of hypertension based on age. The results showed that the number of adult pilgrims with hypertension was higher than that of elderly pilgrims. This finding is consistent with previous research on age- and obesity-related factors associated with hypertension, which reported that hypertension was more prevalent among adult respondents compared to other age groups (Ababa et al., 2021). This results may be influenced by differences in study populations, prior hypertension treatment or management, and variations in data collection and analytical methods.

In the group of pilgrims without hypertension, adult respondents were also more numerous than elderly respondents. This finding is in line with previous studies indicating that non-hypertensive respondents were predominantly adults rather than elderly individuals (Nafila & Rusmariana, 2021). This pattern may be explained by age-related physiological changes, behavioral factors, and lifestyle differences, where elderly individuals are generally more vulnerable to hypertension. When examined by age category, a higher proportion of adults did not have hypertension, whereas in the elderly group, a greater proportion experienced hypertension. This supports the established risk factor of age in

hypertension, where increasing age is associated with decreased vascular elasticity and a higher likelihood of elevated blood pressure (Kim, 2023).

Based on gender, this study found that male pilgrims outnumbered female pilgrims in the hypertension group. This result is consistent with previous studies examining hypertension risk factors, which found a higher prevalence of hypertension among men compared to women (Connelly et al., 2022). This similarity may be attributed to biological factors, such as the influence of testosterone on blood pressure regulation, as well as lifestyle habits including smoking and alcohol consumption, and social or economic pressures that may contribute to elevated blood pressure (Miao et al., 2023). In the non-hypertension group, male respondents were also more numerous than female respondents, which may reflect the overall distribution of respondents in this study. From a gender perspective, more than half of male pilgrims experienced hypertension, while most female pilgrims did not. This may be influenced by lifestyle differences and hormonal factors, as estrogen in women is known to have a protective role in regulating blood pressure (Drury et al., 2026).

Distribution of Stress Levels among Hajj Pilgrims in Medan City in 2024 Based on Hypertension History

Table 3. Distribution of Stress Levels by Hypertension History

Stress Level	Hypertension History		Gender		Age	
	Has	No	Male	Female	Adults (19 - 59)	Elderly (60 ≥)
Low Stress	10	20	17	13	25	5
Moderate Stress	18	8	14	12	18	8
Severe Stress	0	0	0	0	0	0

Among pilgrims with hypertension, 10 individuals (17.86%) experienced low stress and 18 individuals (32.14%) experienced moderate stress, while none experienced severe stress. In contrast, in the non- hypertensive group, 20 individuals (35.71%) reported low stress and 8 individuals (14.29%) reported moderate stress, with no cases of severe stress. These findings indicate that low stress was more common among non-hypertensive pilgrims, whereas moderate stress was more frequent among those with hypertension. By gender, 17 male pilgrims (30.36%) reported low stress and 14 (25%) moderate stress, while 13 female pilgrims (23.21%) reported low stress and 12 (21.43%) moderate stress. Overall, the majority of both low and moderate stress groups were male

Based on age, 25 adults (44.64%) experienced low stress and 18 (32.14%) experienced moderate stress, while among the elderly, 5 (8.93%) experienced low stress and 8 (14.29%) moderate stress. This shows that adults constituted the majority in both the low and moderate stress categories.

Regarding stress levels based on hypertension history, this study found differences between pilgrims with and without hypertension. Among pilgrims with hypertension, fewer respondents experienced low stress (10 individuals) compared to those with moderate stress (18 individuals), and none experienced severe stress. In contrast, among pilgrims without hypertension, the majority experienced low stress (20 individuals), followed by moderate stress (8 individuals), with no cases of severe stress. The predominance of low and moderate stress levels, with no severe stress identified, suggests that pilgrims generally demonstrated good coping and adaptation to stressors during the Hajj. This may be supported by positive coping mechanisms, healthy lifestyles, and social support from Hajj officers, family members, and fellow pilgrims. Previous studies have shown that strong social support can reduce both emotional and physical stress, particularly in individuals with chronic medical conditions such as hypertension (Riahi et al., 2023).

In the adult age group, most pilgrims experienced low stress (25 individuals) or moderate stress (18 individuals), with no cases of severe stress. This indicates that adults may possess better adaptive capacity toward stressors, potentially due to better physical condition and effective stress management strategies. These findings align with previous studies suggesting that age, physical fitness, and coping ability play important roles in stress management (Kollmann et al., 2022). However, this study did not assess other factors that may influence stress levels, such as social support or psychological conditions.

Among elderly pilgrims, although fewer individuals experienced low stress (5 individuals), the majority experienced moderate stress (8 individuals). This suggests that elderly pilgrims may be at higher risk of stress during the Hajj pilgrimage. Possible contributing factors include decreased physical endurance, limited mobility, and comorbid medical conditions. Previous studies have reported that elderly individuals are more susceptible to stress due to environmental changes, disruptions in daily routines, and declining physical health (Aisyah, 2022). The relatively smaller number of elderly respondents in this study may also have influenced the findings. Although no cases of severe stress were observed, the results highlight the importance of increased attention to the well-being of elderly pilgrims during the Hajj.

When analyzed by gender, most male pilgrims experienced low stress (17 individuals), followed by moderate stress (14 individuals), with no cases of severe stress. This finding suggests that male pilgrims generally managed stress well during the pilgrimage. Previous research has suggested that men tend to adopt problem-focused coping strategies when dealing with stress (Marwaha, 2022). However, this study did not explore additional factors such as social support or religious coping that may contribute to effective stress management. Among female pilgrims, 13 individuals experienced low stress and 12 experienced moderate stress, with no severe stress observed. The small difference between low and moderate stress levels indicates that female pilgrims also demonstrated adequate stress management. Nevertheless, this study did not identify specific coping strategies used by female pilgrims, which represents a limitation.

Overall, the analysis in this study indicates that hypertension is associated with higher stress levels among Hajj pilgrims in Medan City in 2024. Stress during the Hajj pilgrimage may arise from various factors, including long travel duration, changes in climate and environment, and physically demanding rituals. These conditions may contribute to increased psychological burden, particularly among pilgrims with underlying medical conditions such as hypertension. For pilgrims with hypertension, stress may exacerbate their medical condition or increase the risk of complications. Previous studies have reported that individuals with hypertension tend to experience higher stress levels than those without hypertension (Marwaha, 2022). This finding is consistent with the present study, in which hypertensive pilgrims exhibited higher stress levels. This relationship may be explained by the physiological link between stress and hypertension, where stress increases cortisol production, potentially worsening blood pressure control (25).

Despite these findings, several limitations must be considered. The sample size was relatively small and limited to pilgrims from Medan City in 2024, which may restrict the generalizability of the results. In addition, the cross-sectional design limits the ability to determine causal relationships between stress and hypertension. It cannot be conclusively stated whether hypertension leads to increased stress or whether stress contributes to worsening hypertension. Longitudinal studies are needed to better clarify this relationship. Furthermore, this study did not assess other potential determinants of stress, such as psychological conditions, Hajj experiences, or levels of social support.

Association Between Hypertension History, Gender, Age, and Stress Levels Among Hajj Pilgrims

Table 4. Analysis of the Association Between Hypertension History, Gender, Age, and Stress Levels Among Hajj Pilgrims

Variable	p-value
History of Hypertension	0,007
Gender	0,823
Age	0,213

Based on the table, a significance value of 0.007 was obtained for hypertension status, indicating a significant difference in stress levels between pilgrims with and without hypertension, with higher stress observed in the hypertensive group. In contrast, the analysis by gender ($p = 0.832$) and by age category ($p = 0.213$) showed no significant differences, suggesting that stress levels did not vary substantially according to gender or age.

Based on age category, no significant difference in stress levels was found between pilgrims with and without hypertension. This suggests that age alone does not influence differences in stress levels among pilgrims. This finding contrasts with the assumption that older individuals are more vulnerable to stress and hypertension. One possible explanation is that elderly individuals may possess

greater life experience and coping skills, while adults may experience stress from work, family responsibilities, and social pressures unrelated to medical conditions. Previous studies have reported mixed findings, suggesting that stress levels are influenced more by individual, environmental, and lifestyle factors rather than age alone (Lucini et al., 2023).

This study also found no significant difference in stress levels between male and female pilgrims with or without hypertension. This result contrasts with some previous research suggesting that women experience higher stress levels than men due to emotional and social factors (Viertiö et al., 2021). However, the findings of this study indicate that gender does not significantly affect stress levels among pilgrims. Factors such as physical health, coping strategies, prior pilgrimage experience, and social support may play a more substantial role than gender itself.

CONCLUSION

Hypertension is significantly associated with elevated stress levels among Hajj pilgrims in Medan. Pilgrims with hypertension tend to experience higher stress compared to those without, regardless of age and gender. These findings directly indicate that hypertension is an important determinant of psychological stress during the Hajj pilgrimage. Therefore, targeted interventions such as optimal blood pressure control and psychological support are essential to improve pilgrims' overall well-being and readiness during Hajj. Future studies should include a larger and more diverse sample to improve generalizability. Additional variables such as educational level, socioeconomic status, social support, and cultural factors should be explored to better understand determinants of stress among pilgrims. Longitudinal or cohort designs are also recommended to assess causal relationships and changes in stress levels before, during, and after the Hajj pilgrimage.

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