Analysis of Risk Factors for the Death of Hajj Pilgrims from the Surabaya Embarkation Point in 2023

Gunawan Widodo[1,2] , Annisa Brilian[3], Nurani Hakiki[3]

[1]Head Coordinator of Medical Staff Education in the field of Internal Medicine at the Regional General Hospital for Hajj in East Java Province.

[2]Lecturer for professional medical students in the field of Internal Medicine at the Faculty of Medicine, Muhammadiyah University of Malang, East Java, Indonesia.

[3]Medical professional student at the Faculty of Medicine, Muhammadiyah University of Malang, East Java, Indonesia.

ABSTRACT

East Java ranks first in Indonesia for the number of Hajj pilgrims at high risk of death. Therefore, it is important to identify risk factors related to the death of Hajj pilgrims, especially age, gender, and comorbidities or underlying diseases. This study is focused on the Surabaya embarkation point as it contributes the most to the occurrence of Hajj pilgrim deaths. To determine the health profile of Hajj pilgrims from the Surabaya embarkation point who died during the 2023 Hajj season, the risk factors associated with the deaths of Hajj pilgrims from the Surabaya embarkation point in 2023, and to assess the implementation of healthcare services for prospective Hajj pilgrims. The research method is an analytical observational study with a crossectional design. The data is analyzed through univariate and bivariate analysis using chi-square. The analysis of this study utilizes bivariate analysis with chi-square, where the results indicate that initial screening is one of the risk factors influencing the high mortality rate of Hajj pilgrims from the Surabaya embarkation point. Deceased Hajj pilgrims from the Surabaya embarkation point are mostly male, with 103 male pilgrims and aged ≥ 65 years, comprising 129 pilgrims. The leading cause of death among Hajj pilgrims is cardiovascular disease, accounting for 72 pilgrims (42.1%). Initial screening is one of the risk factors that influences the high or low mortality rate of Hajj pilgrims from the Surabaya embarkation point in 2023.

Keywords : *Hajj, Surabayan Pilgrims, Risk Factor, Mortality*

INTRODUCTION

The pilgrimage of Hajj is one of the Islamic rituals performed by Muslims worldwide for those who are capable. It involves a prolonged physical activity (more than 30 days) in the Kingdom of Saudi Arabia and takes place in an environment

different from that of Indonesia. This situation necessitates the excellent health condition of prospective Hajj pilgrims, which refers to the optimal, competent, and independent health status of the pilgrims. In accordance with the Quran, Surah Ali Imran, verse 97: "*Performing Hajj is a duty that humans owe to Allah, for those who have the means to undertake the journey to the House of Allah*."[1]

Indonesia sends hundreds of thousands of Hajj pilgrims each year. Many of these pilgrims are elderly individuals due to limited quotas and long waiting periods. Several bodily functions start to decline with age, and Hajj, being a physically and mentally challenging activity, puts this to the test. The rigorous physical activities such as circumambulation (tawaf), sai, standing at Arafah, staying overnight at Muzdalifah, overnight stay and stone throwing at Mina, as well as the optional Umrah, are all carried out in different weather and environmental conditions compared to Indonesia. This situation can impact the health of Hajj pilgrims and lead to the recurrence of health issues among them.[2].

According to Wahjudi (2012), the number of Indonesian Hajj pilgrims in 2012 was around 200,000 people, with a majority being elderly and suffering from various diseases. The proportion of high-risk Hajj pilgrims ranged from 30-45%, mostly due to advanced age. Hypertension and diabetes mellitus were the most common high-risk diseases, accounting for (25-37% C). East Java ranked first in Indonesia for the number of Hajj pilgrims classified as high risk (including those over 60 years of age, suffering from certain infectious diseases, pregnant women, having chronic illnesses or specific diseases, and the number of pilgrims who died). Based on data from the East Java Provincial Health Office (2010) and the East Java Ministry of Religious Affairs from 2009 to 2011, the death rate reached 36% to 42%.[3]

Therefore, further research is necessary to investigate the risk factors that can reduce the mortality rate of Hajj pilgrims, and one of the approaches is by enhancing early screening programs. Thus, every pilgrim should be in a state of physical and mental well-being (istitha'ah). This can be achieved through adequate healthcare services and early health screening. Health examinations involve efforts to identify health status as a foundation for characterization, prediction, and determination of the elimination methods of health risk factors.[2]

The purpose of this research is to investigate the relationship between the deaths of Hajj pilgrims from the Surabaya embarkation point and their referrals to the Hajj General Hospital (RSUD Haji), compare the mortality rates between elderly and non-elderly Hajj pilgrims from the Surabaya embarkation point, and identify the leading causes of death among Hajj pilgrims from the Surabaya embarkation point. The information from this study is expected to be valuable for prospective Hajj pilgrims, healthcare personnel in the pilgrimage groups (kloter), as well as the Ministry of Health. This will enhance the coverage of preventive measures for at-risk groups by implementing appropriate guidance and examinations for prospective Hajj pilgrims.

METHOD

Research Design

The method employed in this study is an analytical observational approach with a cross-sectional design. The data collected is based on secondary data from Hajj pilgrims of the Surabaya embarkation point who meet the inclusion criteria.

Population and Sample

The population for this study includes all Hajj pilgrims from the Surabaya embarkation point in the year 2023. Sampling was conducted using total sampling, meaning all Hajj pilgrims from the Surabaya embarkation point who were referred to the Hajj General Hospital (RSUD Haji Surabaya) and those who passed away in the year 2023.

Data Analysis

The procedure conducted in this study involves collecting secondary data from Hajj pilgrims of the Surabaya embarkation point in 2023. The analysis employed in this study is bivariate analysis, utilizing the chi-square approach.

RESULTS

1. *Hajj Pilgrims' Characteristics*

From the research results regarding the analysis of risk factors for the death of Hajj pilgrims from the Surabaya embarkation point in the year 2023, with a sample size of 278 pilgrims, the following findings were obtained:

Indicator	Category	Frequecy	Precentage (%)

Age	Non Eldery (<65 years)	71	63,4
	Elderly (≥65 years)	41	36,6
Gender	Men	57	50,9
	Women	55	49,1

(Tabel 1: Distribution of Patient Characteristics from the Referral of RSUD Haji Surabaya Embarkation)

Indicator	Category	Frequecy	Precentage (%)
Age	Non Eldery (<65 years)	42	24,6
	Elderly (≥65 years)	129	75,4
Gender	Men	103	60,2
	Women	68	39,8

(Tabel 2 Distribusi Karakteristik Jamaah Haji Embarkasi Surabaya Yang Meninggal)

Based on the results in Table 1, it was found that there were a total of 71 non-elderly pilgrims (< 65 years old) and 57 male pilgrims who were the most frequently referred to RSUD Haji Surabaya. In Table 2, it can be observed that among the Hajj pilgrims from the Surabaya embarkation point who passed away, the majority were male, with a total of 103 pilgrims, and they were aged 65 years or older, comprising 129 pilgrims.

2. *Results of the Analysis of the Relationship Between Screening and Mortality of Hajj Pilgrims from the Surabaya Embarkation Point*

Embarkation Screening	MORTALITY						PR 95% CI	P Value
	Death		Lives		Total			
	n	%	n	%	n	%		
RSUD Haji Referrals	5	2,9	107	100	**112**	**59,7**	22,40 (9,51 - 52,76)	0.000
Non RSUD Haji Referrals	166	97,1	0	0	**166**	**40,3**		
Total	**171**	**100**	**107**	**100**	**278**	**100**		

(Tabel 3: Relationship Between Embarkation Screening and Hajj Pilgrims' Mortality)

Table 3 shows that among Hajj pilgrims from the Surabaya embarkation point who were referred to RSUD Haji, 112 (59.7%) were alive, and 5 (2.9%) had passed away. The chi-square test results indicate a significant relationship between embarkation screening and the mortality of Hajj pilgrims, with a p-value of 0.00 (<0.05). The Prevalence Ratio (PR) value is 22.40 (9.51 - 52.76), indicating that embarkation screening is a risk factor for Hajj pilgrims' mortality (PR > 1). Hajj

pilgrims from the Surabaya embarkation point who were not referred during the initial screening had a 22.40 times greater risk of dying during the Hajj pilgrimage. This highlights the crucial role of early screening in preventing complications from comorbid diseases among the pilgrims during the Hajj pilgrimage.

3. *Results of the Analysis of Hajj Pilgrims' Mortality Rates and Causes*

Death cause	Age					
	Elderly		Non Elderly		Total	
	n	%	n	%	n	%
Cardiovascular Disease	55	32,2	17	9,9	**72**	**42,1**
Cerebrovasculer Disease	0	0	2	1,2	**2**	**1,2**
Metabolic, Endocrine, dan Infection Disease	41	24	9	5,3	**50**	**29,2**
Respiratory Disease	22	12,9	7	4,1	**29**	**17**
Other's Disease	11	6,6	7	4,1	**18**	**10,5**
TOTAL	**129**	**75,4**	**42**	**24,6**	**171**	**100**

(Tabel 4: Hajj Pilgrims' Mortality Rates and Causes)

Table 4 reveals that the leading cause of Hajj pilgrims' deaths is cardiovascular diseases, accounting for 72 pilgrims (42.1%). This is followed by metabolic, endocrine, and infectious diseases, with 50 pilgrims (29.2%), respiratory diseases with 29 pilgrims (17%), other diseases such as malignancy with 18 pilgrims (10.5%), and cerebrovascular diseases with 2 pilgrims (1.2%). The majority of the deceased pilgrims were elderly (≥ 65 years old), totaling 129 pilgrims (75.4%). From the data, it can be observed that among the elderly patients, 55 (32.2%) passed away due to cardiovascular diseases.

DISCUSSION

The Relationship Between Hajj Pilgrims' Mortality and Referral to RSUD Haji Surabaya Embarkation

The research findings indicate that there is a correlation between the mortality of Hajj pilgrims from the Surabaya embarkation point and those who are referred and treated at the RSUD Haji of East Java Province. Pilgrims who are not referred have a higher risk of death during the Hajj pilgrimage. The primary cause of death among the Surabaya embarkation Hajj pilgrims in 2023 is cardiovascular disease. As mentioned in the

study by Shimemeri (2012), conditions related to cardiovascular disease (such as hypercholesterolemia and hypertension) have represented comorbidities among Hajj pilgrims that were not problematic during initial screening but turned out to be the leading cause of referrals and deaths during the Hajj pilgrimage. This is attributed to suboptimal screening procedures for cardiovascular disease comorbidities[12]. Afshin-Nia et al. (1999) explained that an ideal cardiac health examination for prospective Hajj pilgrims should start from the first stage, involving data about age, gender, height, weight, family history, medication history, and past and current health conditions. The subjects are then asked to undergo a general cardiovascular evaluation, including blood pressure measurement, complete blood count, blood glucose, urea, and uric acid tests. Pilgrims with a history of heart disease and conditions related to heart disease are screened using standard epidemiological methods based on past and present medical history. Additionally, they undergo a 12-lead electrocardiogram (EKG), chest X-ray, and echocardiography as needed[16].

One of the models that can be used to predict risk factors is the Framingham model, which can estimate the 10-year risk of developing coronary heart disease [17]. Model Framingham berfungsi menganalisis terkait faktor risiko, termasuk usia, jenis kelamin, tekanan darah, kadar LDL, HDL, riwayat merokok, dan diabetes. The Framingham model functions to analyze risk factors, including age, gender, blood pressure, LDL and HDL cholesterol levels, smoking history, and diabetes. The Framingham model can identify approximately 75-85% of individuals at risk of developing coronary heart disease over the next 10 years[17].

Comparison of Mortality Rates Between Elderly and Non-Elderly Hajj Pilgrims from the Surabaya Embarkation Point

Based on the research findings, elderly individuals (>65 years) have a higher risk of mortality compared to non-elderly Hajj pilgrims (<60 years) from the Surabaya embarkation point. This is supported by the study conducted by Sakti (2019), which states that in advanced age, the body experiences decreased functional capacity and may have comorbid conditions. The research by Elwindra (2020) explains that elevated health risks can occur in the elderly population, especially those with comorbidities, where the combination of advanced age and strenuous physical

activities can exacerbate their conditions and lead to mortality[2].

The study by Jayanti (2017) indicates that age is also influenced by the waiting period for Hajj pilgrims. The Indonesian government's policy for Hajj registration, as of 2014, stipulated a minimum waiting period of 5 years before departing for Hajj, whereas current registrants are experiencing waiting periods of over 17 years. This relatively extended waiting period has led to many elderly Hajj pilgrims performing the pilgrimage with diminished physical strength, increased vulnerability to diseases, difficulty adapting to the new environment, and a higher prevalence of degenerative illnesses among the elderly. Moreover, the prolonged waiting period is also due to the fact that many Hajj pilgrims are not undertaking the pilgrimage for the first time. As a result, numerous pilgrims are embarking on the Hajj journey more than once, further extending the waiting period.[13].

The mortality of Hajj pilgrims from East Java Province in the year 2015 was notably higher among individuals aged 60 years and above. The older the age of the Hajj pilgrims, the more vulnerable they become to diseases[13]. The incidence of mortality among non-elderly Hajj pilgrims (<65 years) was also identified in this study. This is supported by the research of Handayani (2016), which suggests that this phenomenon could be attributed to demographic changes and age composition shifts. Consequently, comorbid diseases such as diabetes and hypertension can affect individuals across all age groups. These changes are marked by an increase in the proportion of the productive and elderly population, coupled with a decline in the proportion of the infant population. Given this trend, the complications of underlying diseases among non-elderly pilgrims are increasingly becoming a concern for developing countries, including Indonesia [13].

The Leading Causes of Hajj Pilgrims' Deaths

The research findings indicate that cardiovascular disease or circulatory disorders are the leading cause of death among Hajj pilgrims from the Surabaya embarkation point in the year 2023. Reports from the Indonesian Hajj Health Center show that Indonesian Hajj pilgrims from 2015 to 2017 were predominantly classified as high-risk, and cardiovascular disease was one of the factors leading to pilgrims being hospitalized and experiencing mortality during the Hajj pilgrimage[15]. In line with the

research conducted by Handayani (2016), it's observed that vascular disorders are among the major causes of death among Indonesian Hajj pilgrims and in other countries as well [14]In Indonesia, East Java holds the record for the highest number of Hajj pilgrim deaths from 2008 to 2023. Circulatory diseases, especially vascular heart diseases, typically occur due to the heart's failure to effectively pump blood throughout the body, insufficient oxygen delivery to the heart, or narrowing of blood vessels due to constriction. Other research findings also indicate that pilgrims diagnosed with circulatory system diseases during health examinations have a 2.02 times higher risk of mortality compared to those not diagnosed with cardiovascular diseases. A study by Yassen and Sameer (2006) demonstrated that hypertension is associated with causing deaths due to cardiovascular disorders (45.8%) [15].

Cardiovascular diseases are often caused by several factors, with the first being insufficient physical activity, which can pose risks to heart health. Inadequate physical activity among Hajj pilgrims increases the risk of mortality during the Hajj pilgrimage in Saudi Arabia. Considering the physical demands of the Hajj pilgrimage, it's crucial for Hajj pilgrims to engage in regular physical routines and enhance their physical fitness in preparation for the pilgrimage activities. Research findings by Handayani (2016) demonstrate that a lack of physical activity among Hajj pilgrims increases the risk of mortality during the Hajj pilgrimage in Saudi Arabia. This risk is compounded by the extreme climate and temperatures in Mecca. [14,15]

CONCLUSION

Health examinations for prospective Hajj pilgrims serve as a ticket to declare someone's eligibility to perform the Hajj pilgrimage and as a preventive measure against exacerbating illnesses leading to death during the pilgrimage. East Java ranks first in terms of the highest number of Hajj pilgrim deaths in the year 2023. The leading cause of death among the Hajj pilgrims from the Surabaya embarkation point in 2023 is cardiovascular disease.

The high mortality rate among Hajj pilgrims from the Surabaya embarkation point in 2023 underscores the need to enhance the role of optimal primary healthcare services in the screening process for prospective pilgrims. This can help reduce the mortality rate among Hajj pilgrims. Additionally, it's crucial for Hajj

pilgrims to understand their physical and mental readiness (istitha'ah) and the potential health threats they may face before or during the Hajj pilgrimage. This understanding enables pilgrims to take protective and preventive measures during pre-pilgrimage preparations, during the pilgrimage itself, and after completing the pilgrimage.

REFERENCES

1. Kholilurrohman. (2017). Hajinya Lansia Ditinjau dari perspektif Bimbingan dan Konseling Islam. Jurnal Dakwah dan Komunikasi : IAIN Surakarta. ISSN 2527-5704 (P) ISSN : 2527-5682 (E)
2. Elwindra. (2020). K3 Pada Pelayanan Kesehatan Haji. Jurnal Persada Husada Indonesia Vol. 7 No. 27 Hal 1-10 ISSN : 2622-4666
3. Pudjo Wahjudi dan Maya Fahmi Putriana, Karakteristik dan Status Kesehatan Jemaah Haji Kabupaten Banyuwangi Tahun 2012, Jurnal IKESMA, Volume 10, Nomor 1, Maret 2014, hal 1-12
4. Cahyani AI. Formal Dalam Peraturan Haji Di Indonesia. El-Iqtishady. 2019;1(2):108.
5. Dewan Perwakilan Rakyat. Undang undang RI No.8 Tahun 2019 tentang Penyelenggaraan Haji dan Umrah. 2019;(004252A):83.
6. Noor M. Haji dan Umrah. J Hum Teknol. 2018;4(1):38–42
7. Kementrian Kesehatan Republik Indonesia. Infodatin Haji 2015 [Internet]. 2015. p. Available from: https://pusdatin.kemkes. go.id/resources /download/ pusdatin/ infodatin/ Infodatin - Haji.pdf
8. Kementrian Kesehatan RI. Permenkes No.15 Tahun 2016 Tentang Istithaah Kesehatan. 2016
9. Levine SM. The Global Impact of Respiratory Disease. Chest. 2022.
10. Pusat Kesehatan Haji Kementrian Kesehatan RI. Petunjuk Teknis Operasional Siskohatkes Bagi Petugas Kesehatan Haji Di KABUPATEN/KOTA Dan Embarkasi. 2019;
11. Sarvasti D. Pengaruh Gender dan Manifestasi Kardiovaskular Pada COVID-19. Indones J Cardiol.

2020;41(2).

12. Al Shimemeri, A. (2012). Cardiovascular disease in Hajj pilgrims. *Journal of the Saudi Heart Association*, *24*(2), 123-127.

13. Jayanti K. (2017). Pelaksanaan Sistem Surveilans Kesehatan Haji di Dinas Kesehatan Kota Surabaya. Jurnal IKESMA Volume 13 Nomor 2 : Fakultas Ilmu Kesehatan Bhakti Wiyata Kediri

14. Handayani D, et al. (2016). Indeks Prediksi Risiko Kematian Jemaah Haji di Provinsi Jawa Timur. Jurnal Wiyata, Vol. 3 No. 2. P-ISSN 2355-6498 |E-ISSN 2442-6555

15. Sakti A, Idrus A , Muhadi HS. (2019). Karakteristik Mortalitas Jemaah Haji Indonesia Akibat Penyakit Kardiovaskular Characteristics of the Indonesian Pilgrims Mortality due to Cardiovascular Disease. J Penyakit Dalam Indonesia. ;6(4):2017–20.

16. Afshin-Nia, F., Dehkordi, H. M., Fazel, M. R., & Ghanei, M. (1999). How to reduce cardiovascular mortality and morbidity among Hajj Pilgrims: A multiphasic screening, intervention and assessment. *Annals of Saudi medicine*, *19*(1), 55-57.

17. Ardiana, M., Utami, E. R., Al Farabi, M. J., & Azmi, Y. (2023). The Impact of Classical Cardiovascular Risk Factors on Hospitalization and Mortality among Hajj Pilgrims. *The Scientific World Journal*, 9037159.

18. Taibah, H., Arlikatti, S., Andrew, S. A., Maghelal, P., & DelGrosso, B. (2020). Health information, attitudes and actions at religious venues: Evidence from hajj pilgrims. *International journal of disaster risk reduction : IJDRR*, *51*, 101886. https://doi.org/10.1016/j.ijdrr.2020.101886

19. Rustika, R., Oemiati, R., Asyary, A., & Rachmawati, T. (2020). An Evaluation of Health Policy Implementation for Hajj Pilgrims in Indonesia. *Journal of epidemiology and global health*, *10*(4), 263–268. https: // doi.org /10.2991 /jegh.k. 200411.001

20. Badan Pengembangan dan Pembinaan Bahasa (Pusat Bahasa) ES. Kamus Besar Bahasa Indonesia

(KBBI) Haji [Internet]. 2022 [cited 2022 Jan 20]. Available from: https://kbbi.web.id/haji

21. Departemen Gizi Kesehatan Masyarakat, Fakultas Kesehatan Masyarakat, Universitas Indonesia, Depok 16424, Indonesia. Respons Imunitas Yang Rendah Pada Tubuh Manusia Usia Lanjut. Makara Kesehat [Internet]. 2006;10(1):47–53. Available from: journal.ui.ac.id

22. Direktorat Jenderal Penyelenggaraan Haji dan Umrah. Tuntunan Manasik Haji Dan Umrah Kementerian Agama Ri [Internet]. 2020. 1–354 p. Available from: http://haji.kemenag.go.id

23. Pusat Data dan Informasi Kementrian Kesehatan RI. Infodatin Lansia. 2016;