Algorithm of Hypertensive Urgency Management to Reduce Mass Accumulation During the Third Stage of Hajj Pilgrims' Health Examination: Case Report

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ABSTRACT

The Hajj pilgrimage involves air travel to Saudi Arabia, which poses physiological risks such as hypobaric hypoxia due to decreased air pressure and oxygen saturation, particularly for elderly pilgrims with comorbidities like hypertension. This study evaluates the stage 3 health examination process at the Surabaya Hajj Dormitory to determine fitness to fly status, based on IATA guidelines that classify hypertension as a potential aviation safety risk. Hajj pilgrims experiencing hypertensive urgency are also unable to be sent to the holy land because they do not meet the requirements for hajj istita'ah. The discussion covered the mechanisms of hypoxia compensation that increase blood pressure, potentially leading to heart failure or stroke. Analysis of four cases of hypertensive urgency showed variations in management, such as rest, oral medication (amlodipine, captopril), or sublingual (ISDN), with a target blood pressure of <180/110 mmHg. Challenges include overcrowding, delays in mass gathering services, and a lack of special observation. Recommendations included creating a dedicated post for observing hypertensive urgency with manual/digital blood pressure monitors, treatment algorithms based on guidelines (captopril 12.5-25 mg, nifedipine 5-10 mg, ISDN 10 mg), strict monitoring to avoid hypotension, and effective communication with group officials for ongoing management. This effort aims to reduce flight risks and improve the efficiency of Hajj healthcare services.

Keywords: Mass gathering, Hajj, Embarkation, Hypertensive Urgency

INTRODUCTION

The Hajj is one of the five pillars of Islam and is obligatory for all able-bodied Muslims. During the Hajj, pilgrims from all over the world gather in one location, the Holy Land in Saudi Arabia (Wulandari et al., 2023). Most pilgrims travel to Saudi Arabia by airplane (referring to Ministry of Health regulations). This poses challenges because the aviation environment is not natural for humans, who are primarily terrestrial creatures. High altitude causes physiological changes that can exacerbate existing illnesses (IATA, 2020).

Physiological changes at high altitude expose individuals to reduced air pressure, decreased partial pressure of oxygen, temperature changes, vibration, and acceleration (G-force acceleration and cosmic radiation). Furthermore, physiological changes at altitude, cabin conditions, and flight duration can also contribute to complaints experienced during flight. At sea level (1 atm), the measured air pressure is 760 mmHg, with oxygen saturation around 97%. At 10,000 feet, the measured air pressure is 460 mmHg, with oxygen saturation of 87%. The increase in altitude from sea level (1 atm) to 10,000 feet reduces oxygen saturation by approximately 10% (IATA, 2020).

In practice, the Hajj pilgrimage by air is regulated by Minister of Religious Affairs Regulation Number 13 of 2021 concerning the Implementation of Regular Hajj Pilgrimages, which states that pilgrims must meet the health requirements to pay the full cost of the Hajj (BPIH). One health problem frequently encountered among pilgrims is hypertension, which is common because most pilgrims are elderly. Hypertension in pilgrims not only affects their istita'ah status but also their fitness to fly. This is because pilgrims with comorbid hypertension must monitor their blood pressure, as hypertension can become an emergency (Okyay, 2021). This is caused by the hypoxic condition that occurs when a person experiences an increase in altitude from sea level (1 atm) to 10,000 feet, which reduces oxygen saturation by approximately 10%. This causes the heart to pump more oxygen, leading to increased blood pressure. This uncontrolled increase increases the risk of heart failure, stroke, pulmonary embolism, and other life-threatening conditions (Hall and Guyton, 2016). Therefore, evaluating and managing hypertension in Hajj pilgrims is a key focus to ensure safe air travel and a smooth Hajj pilgrimage, while minimizing health risks that could compromise pilgrims' physical readiness in the Holy Land.

METHOD

This series of case reports was a report on the embarkation conditions of rapid examination of 3 Hajj pilgrims who experienced urgent hypertension and caused crowding during embarkation at the Surabaya Hajj Dormitory in 2025.

CASE REPORT

This report documented four cases of Hajj pilgrims who experienced hypertensive crises during the third phase of the health screening at the departure point in Surabaya, where their initial blood pressure exceeded 180/110 mmHg. To obtain flight status, interventions were performed to lower blood pressure below this threshold. Common precipitating factors in all cases included fatigue due to sleep deprivation for approximately two days due to receiving guests prior to departure, a smoking habit of approximately one pack per day, and the absence of major complaints such as dizziness, nausea, vomiting, blurred vision, weakness, or tingling sensations on one side of the body. Furthermore, all cases had a negative family history of medical conditions, with urinary and bowel functions within normal limits.

Case 1 involved Mr. S, a 75-year-old man from Tulungagung, part of the first group, with no history of hypertension or diabetes. Physical examination revealed a blood pressure of 215/112 mmHg, a heart rate of 86 beats per minute, a respiratory rate of 18 breaths per minute, a body temperature of 36.3°C, and an oxygen saturation of 95%. The intervention began with a 15-minute

rest period, which lowered blood pressure to 201/111 mmHg, followed by the administration of 10 mg of oral amlodipine. After 30 minutes, blood pressure dropped to 173/92 mmHg, and the pilgrims were declared fit to fly.

Case 2 involved Mrs. S, a 73-year-old woman from Tulungagung, part of flight group 1, with a history of hypertension, diabetes, and left ventricular hypertrophy. She had taken her regular medications, including bisoprolol 5 mg and hydrochlorothiazide 25 mg, in the morning. A physical examination revealed a blood pressure of 215/108 mmHg, a heart rate of 111 beats per minute, a respiratory rate of 18 breaths per minute, a body temperature of 36.2°C, and an oxygen saturation of 99%. Initial intervention, an additional 10 mg of oral amlodipine, did not significantly lower his blood pressure (it remained at 212/109 mmHg), so he was referred to the emergency room. There, captopril 12.5 mg and ISDN 2.5 mg were administered sublingually, and after three hours of observation, his blood pressure dropped to 164/95 mmHg, declaring him safe for flight.

In Case 3, Mr. U, a 54-year-old man from Kediri, part of flight group 3, had a history of hypertension without diabetes and no history of regular medication use. A physical examination revealed a blood pressure of 220/115 mmHg, a heart rate of 98 beats per minute, a respiratory rate of 18 breaths per minute, a body temperature of 36.2°C, and an oxygen saturation of 98%. The doctor immediately administered 5 mg of ISDN sublingually, and after 30 minutes, his blood pressure dropped to 170/100 mmHg, declaring him safe for flight.

Case 4 involved Mr. M, a 54-year-old man from Blitar, part of flight group 9, with a history of hypertension without diabetes and no history of regular medication use. A physical examination revealed a blood pressure of 213/130 mmHg, a heart rate of 86 beats per minute, a respiratory rate of 18 breaths per minute, a body temperature of 36.2°C, and an oxygen saturation of 98%. The attending physician decided to immediately refer the patient to the outpatient clinic, where he was given 12.5 mg of captopril and 2.5 mg of sublingual ISDN. After two hours of observation, the patient's blood pressure dropped to 160/90 mmHg, and he was declared fit to fly.

Overall, interventions in the four cases varied between rest, oral medications such as amlodipine, and sublingual medications such as captopril and ISDN, with referral to the outpatient clinic for cases more resistant to blood pressure reduction. All pilgrims eventually reached target blood pressure and were declared fit to fly, underscoring the importance of prompt and effective management in mass gathering situations such as the reception of pilgrims.

DISCUSSION

This discussion outlines the International Air Transport Association (IATA) guidelines regarding four passenger conditions requiring medical approval, including infectious diseases, risk of harm to others, threat to flight safety, inability to care for oneself, and medical conditions negatively affected by the flight environment. Hypertension was categorized as a potential safety risk and a condition that can be exacerbated by in-flight hypoxia, in which blood pressure increases as a compensatory mechanism for decreased oxygen saturation due to reduced atmospheric pressure.

In-flight hypobaric hypoxia causes a decrease in oxygen levels in the body, with stages ranging from compensatory (altitude 0-15,000 feet, SpO2 98-80%) to critical (20,000-23,000 feet, SpO2 65-60%), characterized by symptoms such as increased respiratory and heart rates, fatigue,

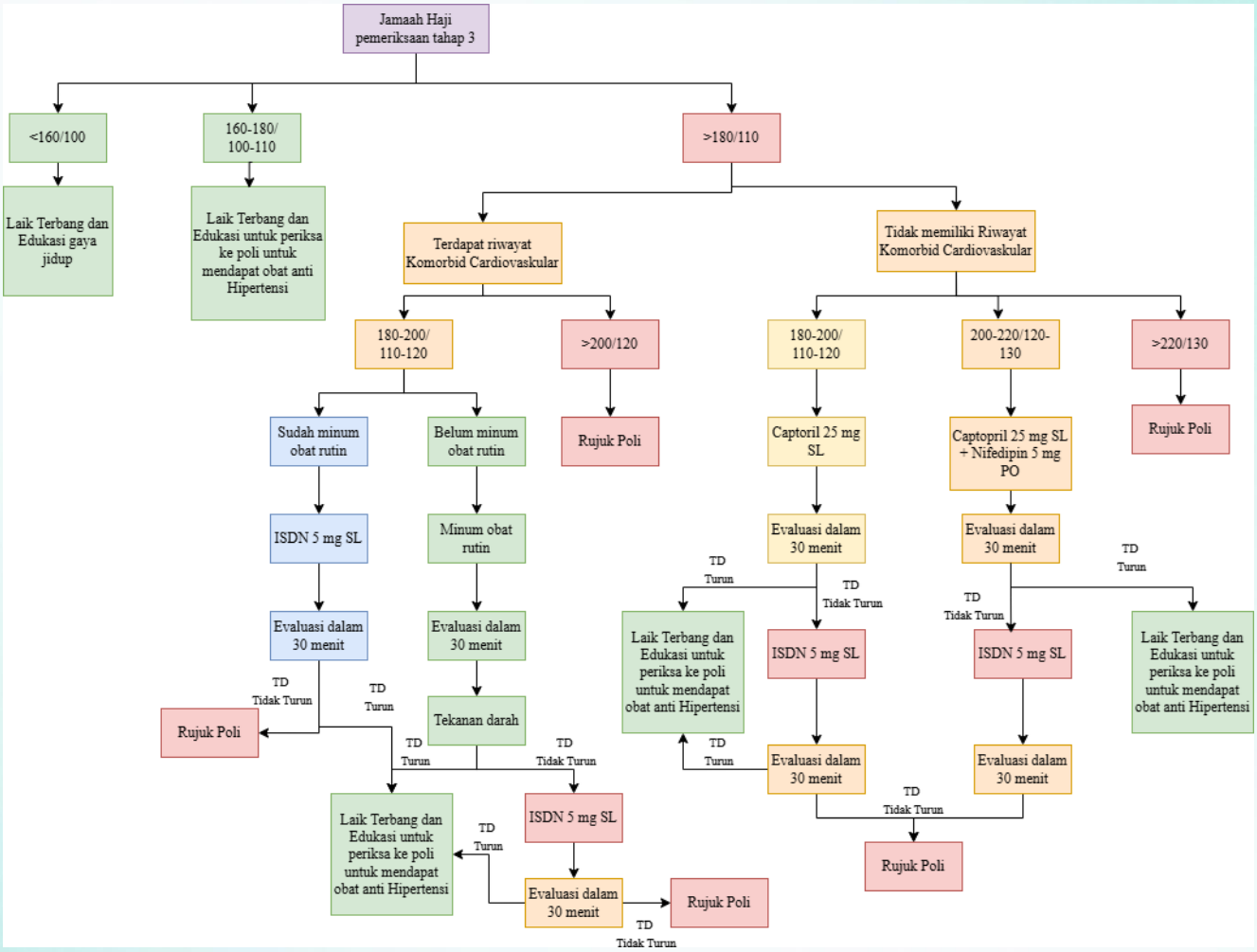
dizziness, and loss of consciousness. Commercial aircraft typically fly at altitudes of 30,000-42,000 feet for efficiency, resulting in an average oxygen saturation of 90-93% in healthy individuals and up to 80% in cardiopulmonary patients. Therefore, at-risk passengers, such as elderly pilgrims with comorbidities, require extra attention.

In the context of the Hajj season, a situation of mass gatherings, the stage 3 health check at the Surabaya Hajj Dormitory aims to determine suitability for flying to prevent deterioration during the flight. Hypertension is a focus because hypoxia compensation can trigger a significant increase in blood pressure, risking stroke or heart failure. Four cases of hypertensive emergencies are illustrated: The first case (without a history of hypertension) was treated with rest and 10 mg of amlodipine, reducing blood pressure from 205/112 to 173/92 mmHg; the second case (with a history of hypertension, diabetes, and low blood pressure) required referral to the emergency unit with administration of 12.5 mg of captopril and 2.5 mg of sublingual ISDN, which reduced blood pressure from 215/105 to 164/95 mmHg; The third case (with a history of hypertension) received 5 mg of sublingual ISDN, which reduced blood pressure from 220/115 to 170/100 mmHg; and the fourth case (without a history of hypertension) was referred to the emergency department and given 12.5 mg of captopril and 2.5 mg of ISDN, which reduced blood pressure from 213/130 to 160/90 mmHg. All cases were triggered by fatigue due to lack of rest, with the airworthiness criterion being <180/110 mmHg.

These cases often hamper service delivery because follow-up observation leads to overcrowding, increasing the risk of stress and further increases in blood pressure due to queues and the lack of dedicated space. Establishing a dedicated post or desk for hypertension emergency monitoring, equipped with digital and manual blood pressure monitors, is recommended to minimize errors and segregate at-risk patients, ensuring uninterrupted general care and reducing referrals to a limited number of clinics.

Variation in treatment between cases suggests a dependence on physician experience, which is complicated by the limited number of physicians. Therefore, a guideline-based treatment algorithm is needed to facilitate staff assignment and delegation of authority. The algorithm should be adapted to field conditions, with the principle of using rapid-release oral medications such as captopril 12.5-25 mg (oral/sublingual), clonidine, labetalol, nifedipine 5-10 mg, or ISDN 10 mg, often a combination of both, followed by close monitoring to avoid excessive pressure drops that could trigger organ ischemia. If blood pressure does not decrease, use intravenous medications such as clonidine or nitroglycerin.

Blood pressure drops at designated stations should be closely monitored for signs of hypotension or ischemia, with the availability of rapid-release medications a prerequisite for flight eligibility. Hypertension, as a chronic comorbidity, requires continuous monitoring during the flight and in the Holy Land, including a supply of medications and extra attention from group staff for pilgrims in crisis, supported by effective communication between receiving staff and the group to manage the risk of elevated blood pressure



Suggested Algorithm of Hypertensive Urgency Management during Hajj Embarkation

CONCLUSION

Hypertension in Hajj pilgrims posed a safety risk because hypobaric hypoxia can increase blood pressure, potentially leading to heart failure or stroke. The third phase of health screening at the departure point in Surabaya targeted a blood pressure of <180/110 mmHg for flight status. Hypertensive emergencies suggested a variety of treatments (rest, amlodipine, captopril, ISDN), but this often hinders services for mass pilgrims due to limited doctors and facilities. Dedicated observation posts with digital/manual blood pressure monitors, guideline-based treatment algorithms using rapid medication (captopril, nifedipine, ISDN), close monitoring to prevent hypotension, and effective communication with airline group staff for ongoing hypertension management during the flight and in the Holy Land are recommended.

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