Ideal Hajj Pilgrim Airplane Seat Configuration Based on Health Condition Priority

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Abstract The Hajj pilgrimage become one of the largest religious mass gatherings involving millions of pilgrims every year. The main challenge of hajj is taking care health pilgrims, especially during long flights. This study analysed airplane seat configuration for hajj pilgrims based on health condition priorities. This case report uses analytical observational methods on a Surabaya debarkation batch of Indonesian Hajj pilgrims in 2024. Problem analysis supported by relevant secondary data. The results show that the ideal seat configuration needs to take into account several factors, such as health pilgrims' conditions before the flight and accessibility for pilgrims with disabilities, the elderly, and those under observation. This will divide into several processes. The pre-flight step involves determination pilgrims' airworthiness and grouping them according to health conditions. In-flight step is positioning each pilgrim on board based on the layout of passenger accommodation with the mobility flow according to first in-first out. Post-flight step consists of sustainable monitoring and evaluation to develop a better system. Therefore, seats configuration of the Hajj pilgrims on the plane based on their health status is a step critical to ensure their safety and comfort during the flight.

Keywords Hajj pilgrims; seat configuration; health flight; layout of passenger accommodation; first in-first out

1. Introduction

Hajj has become one of the largest religious mass gatherings involving around 2 million pilgrims and 185 countries (1). There are many challenges in it, especially about health problem (2). In 2012-2017, the Hajj pilgrims' morbidity rate based on health services visitation around 2.6 million patients with a ratio of 197 per 1,000 (3). Based on the central report Indonesian Hajj health, the majority of Indonesian Hajj pilgrims own a lot of underlying health condition, which put them at risk to be treated on

hospital or died during Hajj (4). The 2024 Hajj Pilgrim Quota is divided into 333 batches flight and 106 batches at Surabaya embarkation. Data from the Ministry of Religion's Integrated Hajj Information and Computerization System noted that 213,275 had been sent to the Mecca and 45 others were not fit to airworthiness because various conditions such as death, pregnancy, and illness (5).

Hajj health supports the Hajj pilgrims by promotive, preventive, curative and rehabilitative ways. This is a main thing to be adapted with many factors such as physical environment (temperature, air humidity, dust), social, psychological, and other conditions that affect the pilgrim's body immunity. In addition, most health conditions of Hajj pilgrims are affected by internal risk factors including age, education (mostly graduated elementary and senior high school), the underlying disease (degenerative and chronic diseases), and their behaviour. Those factors become the health profiles of Indonesian Hajj pilgrims (6).

The Hajj Pilgrimage Organizer in the Health sector begins from the embarkation process within their origin areas, during the Hajj pilgrimage in Saudi Arabia, until the debarkation process to the local government. All of these things involve various part such as Saudi Arabian Hajj Pilgrimage Organizing Officers for Health, Hajj Health Workers, and Health Support Workers who carry out tasks in a coordinated and collaborative manners. This also relates to inter-sectoral collaboration beside health sector, for example collaboration between hajj officers in Saudi Arabia, airlines flights and hajj officers in Indonesia during the debarkation (7).

Many conditions can affect Hajj pilgrims' health during the long flights, both embarkation and debarkation. The aircraft cabin has a lower oxygen partial pressure, resulting in hypoxia. This slight effect the passengers healthy (mean arterial oxygen saturation dropped from 97% to 93%) but it may be more pronounced or symptomatic in passengers with underlying health conditions. Prolonged sitting and hypoxia can trigger decreased venous flow, systemic inflammation, and platelet activation, which be associated with venous thromboembolism (8).

Air circulation in the cabin also tends to low humidity that make passengers on risk of dehydration. Closed air circulation increases the risk transmission of infectious diseases. These things can affect the overall health conditions and requires regular monitoring (9). In addition, pilgrims with disabilities and the elderly require specific for accessibility to the toilet and the in-out way from the plane especially during emergency evacuation (10).

To meet these needs, airlines and Hajj authorities can collaborate to determine appropriate seats for pilgrims based on the health data collected. This data includes medical history and current conditions before the flight. The seat configuration during the flight can follow several international recommendations, such as layout of passenger accommodation and first in-first out. This case report aims to analyse ideal seats configuration for Hajj pilgrims during flights according to health condition priorities.

2. Methods

This study is a case report regarding Hajj pilgrim seat configuration problem on the plane during Indonesian Hajj debarkation in 2024. The study was conducted using analytical methods observational on a batch debarkation Indonesian Hajj pilgrim 2024. Problem factors that have been identified will be analysed in this report with relevant secondary data (Figure 1).

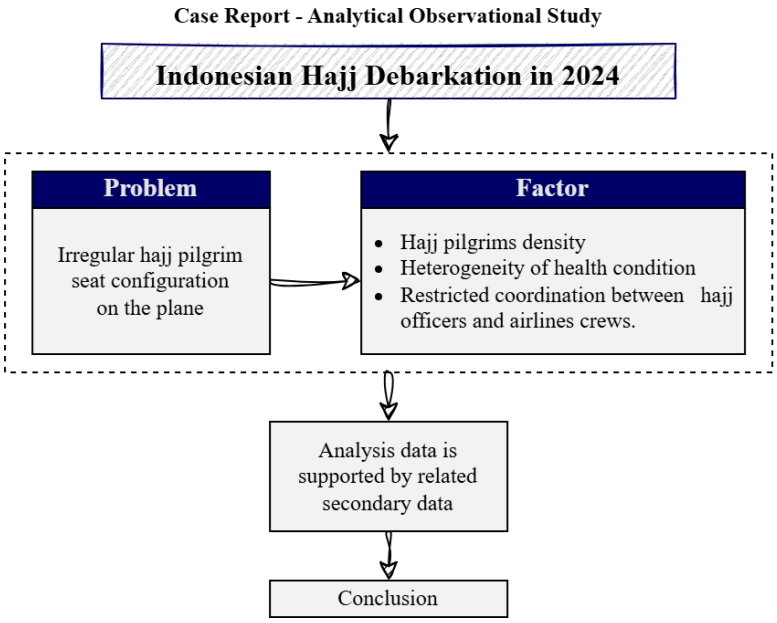

Figure 1. Research Method

3. Case Description

A Hajj pilgrim debarkation batch with code SUB-39 was planned landed in Surabaya on July 3, 2024 at 06.00. Based on information from medical team on the plane, details of the pilgrims as follows:
Total pilgrims on the plane: 370 people
(Male: 181 and Female: 189)
Pilgrims left behind in Arabia: 1 person
1. Mrs. Paini Markom. E5609796
Diagnose: Cardiogenic Shock, Right Ventricle Failure, Ascites, Pneumonia

Pilgrims transferred from other batch: 3 people
After hospitalized in Arabia (Under observation)
1. Qistiyati E5472833/SUB 65
Diagnose: Dementia, post sepsis et cause pneumonia, hypoventilation
2. Muslimah Abd Umar E3968438/SUB 89
Diagnose: Acute respiratory distress, Septic Shock
3. Aspiat E5614545/SUB 57
Diagnose: Vomiting, Low Intake in last 2 days, diabetes type 2
Pilgrims died in Saudi Arabia/Airplane: zero

Disabilities: 13 people
* Wheelchair: 11
* Stick: 2

When the plane had landed, the health teams immediately went on-board to check the overall condition of the pilgrims and confirm the data that had been provided by medical team on plane. Cabin conditions on chaos because pilgrims want to immediately get off the plane while the doctor was busy reporting patient status. They were crowding out of the plane from the front and back door through the hallway or stairs and pilgrims with stick seen difficult to make a way. When medical team on plane gave a report of pilgrims on observation which their seats weren't close to medical team seat. One pilgrim in the front row and another 2 pilgrims in the back row. The doctor explained that the pilgrims were spread out because of the restricted regulation from the airline. In addition, pilgrims with wheelchairs also sit far from the exit door, making it difficult mobilization to the incapacitated passenger lift (Figure 2).

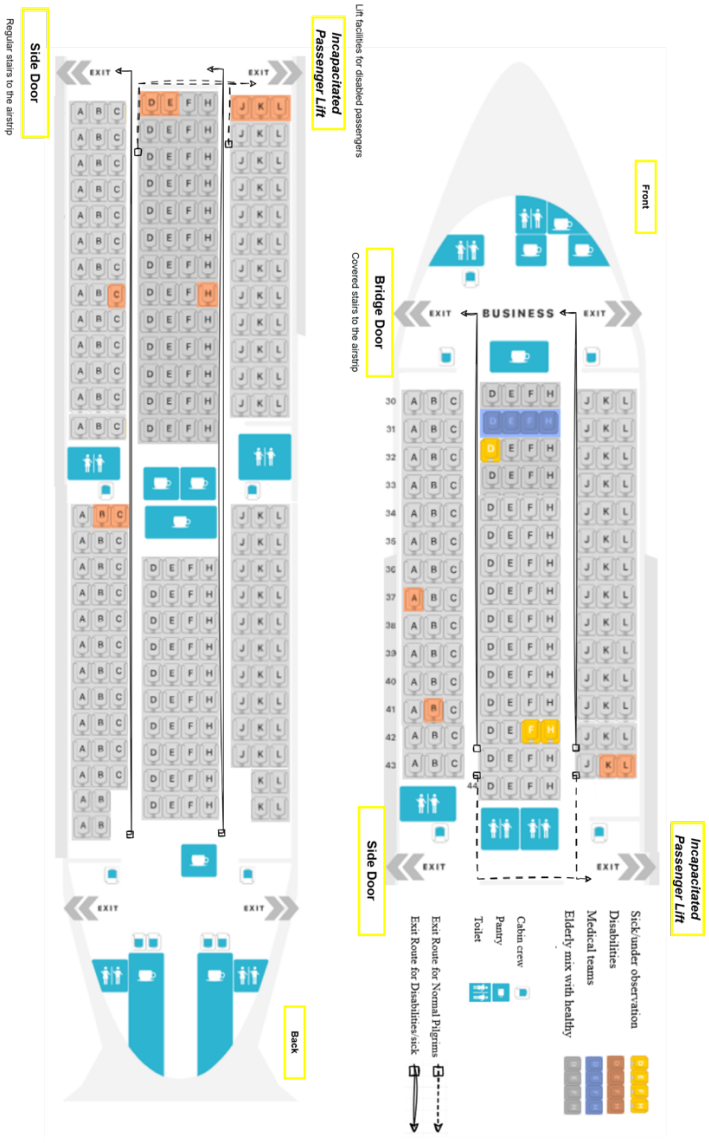

Figure 2. Hajj Pilgrims' Airplane Seat Based on Case

4. Results and Discussion

Plane seat configuration for Hajj pilgrims based on health condition is an important issue that affects safety, comfort and efficiency during the flight. This composing chair approach can help the better evaluation periodically pilgrim's health condition, giving quick access to respond a medical emergency and prevent disease transmission during flights (11). Based on the case, there are several problem factors, including Hajj pilgrims' density, variability of their health condition which require regular monitoring and coordination between hajj officers and airlines crews. Hajj pilgrims can be grouped before departure to the airport. In general, this seat configuration process of the hajj pilgrims divided into 3 steps, such as pre-flight, in-flight and post-flight.

Pre-flight step is health screening and adjustment it to their seat. These are carried out by doctors with medical flight competence based on the patient's diagnosis. This assessment can identify the special pilgrims need. There are some airworthiness criteria must be considered as below:

a. Infectious diseases potential plague.
b. Diseases related to altitude.
c. Diseases with low oxygen saturation.
d. Diseases that endanger other people and aviation (ec acute schizophrenia).

Determination Hajj pilgrims' airworthiness is carried out by referring rule standard international flights same as airworthiness embarkation criteria in the Minister of Health Regulation Number 15 of 2016. Pilgrims who are sick but still meet the airworthiness criteria will be planned to tanazul whereas their health condition will be prepared so that it is possible evacuated to Indonesian Hajj Health Office in Medina to await repatriation (12).

The Hajj pilgrims with their varying health statuses cause challenge especially to monitor general conditions periodically and effectively. To overcome this case, the pilgrims can be grouped based on the following health conditions (13).

- Healthy pilgrims: that is not own significant health problem and does not require medical attention
- Pilgrims with special health conditions: chronic diseases (Chronic obstructive pulmonary disease, hypertension, diabetes, tuberculosis, cardiovascular disease) or disabilities that require special care.
- Elderly Pilgrims: Aged over 60 years and maybe own mobility limited and vulnerable to disease.
- Pilgrims with Disabilities: have physical or mentally limitations needing special help during the flight, such as seats wheel and sticks.

These seats configuration also be adjusted to the plane capacity since there is different aircraft used in each region. The disembarkation in Surabaya (SUB) this year uses Saudi Arabian Airlines Boeing 777-300ER aircraft with 393 seats. In another regions, such as the Batam and

Palembang, they use a Boeing 747-400 aircraft with 450 seats (14). Therefore, this adjustment needs to be done for each batch.

In-flight part based on the Layout of Passenger Accommodation (LoA). The main target of this part is to ensure that passengers, especially those in need special medical observation, elderly, and those with disability, sitting in a location that allows quick access to the medical facility or emergency exit. Based on Shafi (2019) study, the main principles in arranging the Hajj pilgrims' seats include: 1) Convenience access according to needs special such as medical access, toilet and emergency exit; 2) Convenience for pilgrims with disability with wider legroom; and 3) Family or health workers assistance (15). Here are aircraft seat configuration for hajj pilgrims according to guidelines LoA (Figure 3 and Table 1).

Table 1. Pilgrims' Health Details Conditions for Aircraft Seat Configurations (15)

Pilgrims under observation (yellow) **Location:** Front row near health worker. **Accessibility :** Close medical areas. **Security :** Easy accessed by health worker	**Pilgrims with disabilities (red)** **Location** : Middle row with wider access **Accessibility :** Close to emergency exits going to *incapacitated passenger lift* (IPL)/toilet **Security :** Easier fast evacuation in case of emergency . **Comfort :** More space for a wheelchair.
Elderly Pilgrims (green) **Location** : Front to center aircraft part with 1 family member assistance if required **Accessibility :** Close to toilets. **Comfort :** Comfortable seats with wide legroom.	**Healthy Pilgrims (white)** **Location:** Rear of the aircraft . **Comfort :** Standard seats, no need for attention special

In context Hajj passengers with various need health, implementation of First in First Out (FIFO) is very important. Hajj pilgrims dominated by elderly and those with certain health conditions need a efficient and safe seating arrangements. A study conducted by Ahmed et al. (2020) shows that implementing a seating arrangement system that takes health status into account can reduce incident bad medical event during the flight (13). In addition, Yezli and Alotaibi (2019) highlight importance readiness health in mass gatherings such as the high risk of disease transmission and very high health problems (16). The process of seats filling on the plane by the FIFO system (Figure 3).

• Special health condition (Second In): Pilgrims with needs medical observation placed after the disabilities, ensuring they also get access fast to facilities and evacuation.

• Disability (First In): Pilgrims with disabilities came first time and get seats near the emergency exits so they can be evacuated formerly if emergency condition happens.

• Elderly (Third In): Elderly placed in the middle for give balance between convenience and accessibility.
• Healthy (Last In): Healthy pilgrims placed on the last section because they no need for attention special priority.

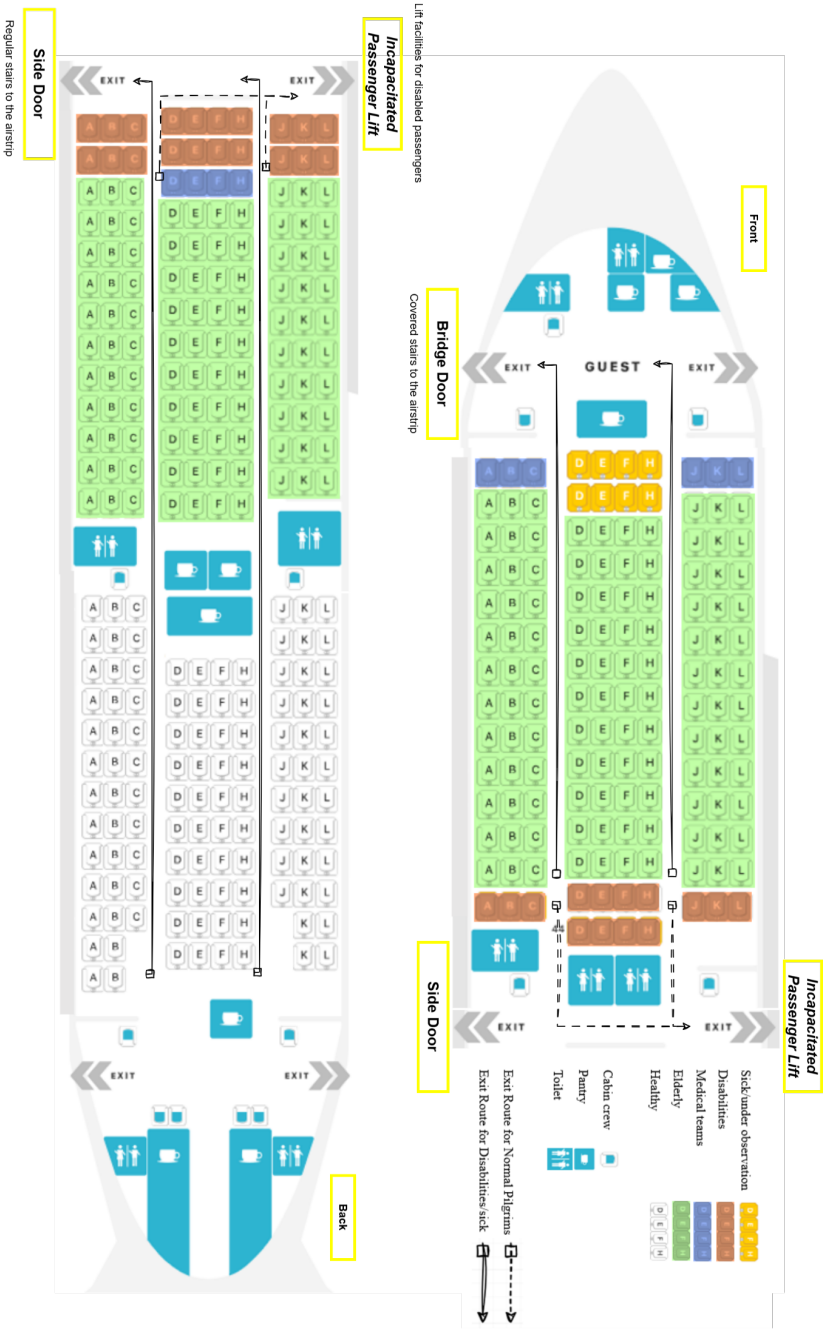

Figure 3. Arrangement Recommendation of Hajj Pilgrims' Seats on the Plane

Aircraft seat configuration Hajj pilgrims also require sustainable supervision and evaluation to ensure all aspects of this system running well. Monitoring that can be done includes: 1) Pre-flight, any changes in health conditions of pilgrims during the disembarkation process need to be monitored and addressed in real time e. 2) in-flight, any medical incidents that appears need to be quick handled, 3) Post flight, feedback from the

pilgrims, crew aircraft, and medical team collected to identify which areas for improvement and refine future protocol placement (17).

The system evaluation includes comprehensive evaluation to various aspects that influence good and efficiency seat arrangement based on health status. Effective evaluation procedures through data analysis from pre-flight, during flight, and post-flight monitoring to assess whether procedures were implemented successfully and meet the health pilgrim needs. This evaluation includes speed and efficiency in handling medical incident and needs during the flight. Satisfaction evaluation get through the pilgrims' feedback about their experience during the flight, such as comfort, security and convenience access to essential facilities. Therefore, all aspects must be evaluated holistically (18).

In this case, the seat configuration system is still inadequate. The sick pilgrims are separated from medical team which makes it difficult in monitoring their health after being hospitalized. Meanwhile, disabled pilgrims, especially those in wheelchairs, are not close to the IPL, making it difficult to mobilize when getting off the plane. The seats near the IPL exit or in the middle part of plane have been designed with wider legroom for enhancing disabilities comfort (15). Several elderly pilgrims who were not accompanied by their families sat mixed with healthy pilgrims and away from the flight attendants. This can reduce comfort during long flights and prevent regular condition monitoring.

Based on the exit flow, this case still does not meet the FIFO system. Not only health workers responsible for Hajj pilgrims, all cabin crew also have a role in directing the priority of which pilgrims can disembark first. Pilgrims who are sick and under observation are the main priority for getting off the plane with a stretcher via IPL or bridge door if they still able to walk. Second, pilgrims with disabilities via IPL. After that, the elderly can slowly descend through the side or bridge door followed by healthy pilgrims. Moreover, medical team on the plane and cabin crew can collaborate to monitor this flow (16). Medical team are responsible for pilgrims under observation while cabin crew monitor disabled and elderly pilgrims. If this system can be implemented well, the risk of accidents will be low and sick pilgrims can quickly receive further treatment (13).

5. Conclusion

Hajj pilgrim seats configuration in this case is still inadequate. This critical system needs to be improved to ensure safety and comfort during the trip. Layout of Passenger Accommodation and First In first Out principles are used to ensure fast and efficient evacuation in case of emergency. Monitoring and evaluation of this system involves each part of pre-flight, in-flight and post-flight, as well as an assessment of effectiveness procedures and pilgrims' satisfaction. This report can be a reference in carrying out the next Hajj event in order to reduce passengers stress and discomfort, improving the overall flights experience, and reduce medical event during the flight. In addition, further research on this topic needs to

be done to assess effectiveness and benefits both systems in the implementation of the Indonesian Hajj.

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