

RESEARCH ARTICLES

ANALYSIS OF FOOD CONSUMED BY INDONESIAN MOSLEM HAJJ PILGRIMS: COMPLETE AND INCOMPLETE NUTRITION

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ABSTRACT

Background: Mabrur Hajj is the purpose of performing Hajj. Pilgrims during the Hajj journey are expected to be physically prepared in addition to financial and security. Health problems while in Mecca such as: the density of the congregation, the diversity of the population, the climate, and the distance from health facilities give rise to the possibility of various infections and non-infections. The aim of this study is to analyze the completeness of nutrition consumed by Indonesian Hajj pilgrims.

Methods: The research design was a cross-sectional study with a total sample of 231 Hajj pilgrim respondents. Data analysis was carried out at the multivariate level.

Results: The research findings indicated that 87% of Indonesian Hajj pilgrims used to consume nutritionally incomplete food (one or more components of carbohydrates, fat, protein, vegetables, and fruit were missing). Respondents who were prone to incomplete nutrition included female pilgrims (1.236 times), those aged over 50

years (1.154 times), pilgrims who had departed in the years 2016-2020 (1.031 times), individuals with a married status (0.204 times), retirees (1.772 times), those who were health-compliant during Hajj (5.657 times), those who used to have three meals per day (3.442 times), those who used to consume supplements (5.213 times), and those who used to take medication (3.442 times).

Conclusion: This research shows that most Indonesian pilgrims during the Hajj or Umrah journey consume incomplete nutrition (at least one of carbohydrates, protein, vegetables and fruit is missing). So it is necessary to educate prospective Hajj pilgrims in the future about the need for Hajj pilgrims to be aware of macronutrient and micronutrient needs during the Hajj pilgrimage. The information from this study is important for Hajj or Umrah organizers to determine policies in overcoming Hajj health problems in the approach of reducing immunity, energy adequacy, physical health and religious approaches.

Keywords: Hajj, pilgrims, macronutrients, micronutrients, supplement

INTRODUCTION

The Hajj pilgrimage is one of the obligations of Muslims to improve spiritually according to the teachings of the Qur'an and this was exemplified by the Prophet Muhammad SAW. The Hajj pilgrimage requires physical readiness to face the extreme high temperatures in Mecca.^{1,2} The Hajj and Umrah rituals require great physical effort and also cause fatigue. Many Hajj pilgrims are not in optimal physical condition, but have a strong desire to still be able to perform the Hajj pilgrimage.^{3,4} In addition, hajj pilgrims are easily infected by diseases due to interactions between Hajj pilgrims throughout the world (such as meningococcus, respiratory tract infections, diarrhea). This infection case also causes a high death rate due to weak body strength.⁵

Some Hajj pilgrims have a history of congenital diseases such as cardiovascular disease, hypertension and other chronic diseases, so sufficient energy and immunity are needed to overcome health problems.^{6,7} Hajj pilgrims is who face conditions like the ones above must try to increase their body's endurance by reducing the risk of health problems through consuming complete nutrition.

Complete nutritional composition can be obtained through macronutrients (carbohydrates, proteins and lipids) and micronutrients (vitamins/minerals from vegetables and fruit). Macronutrients are a source of energy that the body needs. Micronutrients are important in increasing immunity and play a role in improving metabolic processes.⁸ The optimal of body metabolism will increase energy production, muscle growth, increase endurance, and speed

up recovery if health problems occur. Macronutrients and micronutrients are very important for Hajj pilgrims. Hajj pilgrims who cannot meet their nutritional needs through food can also consume supplements with a doctor's consultation.⁹ The complete nutrition has a positive impact on increasing the body's immunity and preventing severity in people who have a history of comorbid diseases.^{10,11}

The Saudi Ministry of Health and the Hajj pilgrims' countries of origin (including Indonesia) have strengthened their health through vaccinations, training programs for public health professionals, providing health services, and global health systems research projects. However, there is no information regarding nutritional services for Hajj pilgrims in order to improve the physical optimization of pilgrims, as well as reduce cases of illness and death during the Hajj or Umrah pilgrimage.¹² In 2008, as many as 206,831 Indonesians performed the Hajj, and there were 446 deaths. The number of deaths peaked significantly at the start of the journey to Mecca. Most deaths were caused by congenital cardiovascular disease (66%) and respiratory tract infections (28%).¹³ In the Hajj pilgrim population between 2012-2017, there was an average increase of 2,237 deaths per year from 4,474 cases of hospitalization in Mecca.¹⁴

Many Hajj pilgrims (around 20-40%) do not finish the food they consume, including Indonesian Hajj pilgrims. Another impact is that wasted food waste causes environmental pollution, the buildup of microorganisms, and the proliferation of insects that can transmit disease. The results of previous research reported that in order to be able to finish food, 75-100% of Hajj pilgrims want proper nutrition, but there is no further nutritional information.¹⁵ Information about the nutrition of Hajj pilgrims is important for preparing nutritional services and increasing the physical stamina of pilgrims to the maximum, its impact can reduce the risk of illness, hospitalization, and death.

Information regarding the physical health of Hajj pilgrims and its relation to nutrition is still very lacking. The importance of initial information regarding the completeness of nutrition consumed by Indonesian Hajj pilgrims is as a reference in meeting nutritional needs in the future. Nutritional needs are the existence of Dietary Reference Intakes (DRI) which is a quantitative standard based on nutritional intake that is used to assess the eating patterns and nutritional intake of certain individuals/populations to be used as a reference in national nutritional policies. The hope of this research is that there will be a national policy on nutritional standards for Hajj pilgrims. Nutritional standards are needed, especially in physiological conditions in general, population activities, as well as paying attention to susceptibility to disease due to special activities, including Hajj pilgrims.¹⁶ This research collects data on the completeness of nutrition consumed based on information on pilgrims who have completed the Hajj or Umrah. The hope of this study is to be able to know, understand and

provide information to Indonesian Hajj organizers as an effort to improve Hajj health based on nutritional intake.

METHODS

The design of this research was quantitative analytical observational studying (cross-sectional), qualitative analytical with open-ended questions and analyzing the experiences faced by individual Hajj pilgrims in consuming nutritional supplements during the Hajj or Umrah journey. Data was obtained using a questionnaire that was given randomly (purposive random) to Hajj or Umrah pilgrims who were willing to fill out the questionnaire via Google form. The questionnaire instrument used in the research has gone through reliability and viability tests using the Cronbach alpha value method (0.750 to 0.826) and Pearson Correlation value ($r > 0.3$). The independent variables were the characteristics of the pilgrims in the form of: sex, age, year of Hajj, status, occupation, health compliant during Hajj, number of meals per day, supplement and prepared medicine; while the dependent variable was consumption of complete nutrition. Data on complete and incomplete nutritional consumption was obtained using a questionnaire to recall the average food consumption of Hajj or Umrah pilgrims. Nutrition is complete if it fulfills carbohydrate, protein, fat, mineral and vitamin molecules, nutrition is incomplete if one of the molecules is not fulfilled. Data analysis was carried out using SPSS version 21 to obtain association values using prevalence odds ratio (POR) estimates with a confidence level of 95% and a p value < 0.05 to determine statistical significance. The target population in this research was all Hajj pilgrims in Indonesia. The inclusion criteria were used all Hajj or Umrah pilgrims over the age of 18 years. The eligible population was 231 pilgrims by consecutive sampling who were willing to fill out the survey.

ETHICAL APPROVAL

This research has received approval from the Ethics Committee of the Faculty of Medicine, State Islamic University (Number:3674022P111242020022400004).

RESULTS

Univariate analysis was used to see the distribution and frequency of each variable in this study, as presented in table 1. In this study, a total sample of 231 Indonesian Hajj pilgrims was obtained which was then analyzed. Of this sample, there were 29 who consumed complete nutritional food (13%) and 202 consumed incomplete nutritional food (87%). The congregation reduces one or more of the main sources of macronutrients and micronutrients by not consuming carbohydrates, protein, fat, vitamin and minerals (vegetables and fruit).

The results of the analysis regarding independent

variables can be seen in the Characteristics of Respondents Independent Variables of Indonesian Hajj pilgrims table (table 2). Hajj pilgrims were differentiated based on sex, age, year of Hajj, status, occupation, health compliance during Hajj, number of meals per day, supplement and prepared medicine. The gender gender was 79 people (34%) and 152 women (66%). Next, bivariate analysis was carried out with the aim of seeing the rough relationship between each independent variable and the dependent variable

(consumption of complete nutritional foods), included in the multivariate model. Based on the results in table 3, it can be seen that the estimated protective factors value for Hajj pilgrims who consume incomplete nutrition was influenced by the interaction of the characteristics of the Hajj pilgrims. The risk value must be seen based on the characteristics of the Hajj pilgrims by calculating the estimated POR value for the incidence of consuming incomplete nutritional food.

Table 1. Frequency of consumption nutritional food for Indonesian Hajj pilgrims.

Variables	Frequency	Percentage (%)
Consumption of complete nutritional food		
Incomplete	202	87
Complete	29	13

Table 2. The Characteristics of Respondents Independent Variables of Indonesian Hajj pilgrims (N= 231)

Variables	Frequency (f)	Percentage (%)
Sex		
Male	79	34
Female	152	66
Age of going for Hajj/umrah		
18-24	21	9
25-50	171	71
>50	39	20
Year of Hajj		
1996-2000	7	3
2001-2005	7	3
2006-2010	14	6
2011-2015	45	14
2016-2020	155	74
Status		
Single	21	9
Married	210	91
Occupation		
Public servants (Worker)	53	23
Private employees (Worker)	45	14
Entrepreneur (Worker)	67	29
Retired	21	9
Student	21	9
Housewife	24	17
Health compliant during hajj		
Cough, flu, or fever	79	34
Swollen foot	7	3
Tired/achy	7	3
weakness/ lack of appetite	7	3
hypertension	12	5
hives/allergies	12	5
Red eyes	7	3
Uric Acid	7	3
Healthy	7	3

Number of meals per day	1 time	0	0
	2 time	32	14
	3 time	187	81
	4 time	12	5
Suplement	Consumtion	170	81
	Not Consumtion	61	19
Prepared Medicine	take medicine	127	55
	not taking medication	104	45

Table 3. Distribution of complete nutritional composition consumed by Indonesian Hajj pilgrims based on respondent characteristics (N=231)

The characteristics of Indonesian Hajj Pilgrims		Nutritional Completeness					P value	POR
		Incomplete		Complete		N		
		n	%	n	%	N		
Sex	Female	133	86	19	14	152	0.066	1.236
	Male	69	88	10	13	79		
Age of going for Hajj/umrah	18-24	17	81	4	19	21	0.004	0.765 1.154
	25-50	160	94	11	6	171		
	>50	37	95	2	5	39		
Year of Hajj	1996-2000	5	71	2	29	7	0.000	0.981 0.540 0.326 1.031
	2001-2005	5	71	2	29	7		
	2006-2010	10	71	4	29	14		
	2011-2015	36	80	8	20	45		
	2016-2020	142	92	13	8	155		
Status	Single	16	76	5	24	21	0.006	0.204
	Married	186	89	24	11	210		
Occupation	Worker	143	86	22	14	165	0.002	1.121 1.772 0.879
	Retired	19	90	2	10	21		
	Student	18	85	3	15	21		
	Housewife	22	97	2	3	24		
Health compliant during hajj	Non Healthy	125	91	13	9	138	0.000	5.657
	Healthy	1	14	6	86	7		
Number of meals per day	2	30	94	2	6	32	0.000	1.054 2.231
	3	168	90	19	10	187		
	4	4	33	8	67	12		
Suplement	Consumtion	165	97	5	3	170	0.000	5.213
	Not Consumtion	37	60	24	40	61		
Prepared Medicine	take medicine	115	91	12	9	127	0.000	3.442
	not taking medication	87	84	17	16	104		

Based on the results of this analysis (Table 3), Indonesian Hajj pilgrims who consume incomplete food nutrition are among the protective factors of female Hajj pilgrims (1,236 times), aged over 50 years (1,154 times), pilgrims who departed in 2016-2020 (1,031 times), married status (0.204 times), retired (1.772 times), health compliance during the Hajj (5.657 times), eating 3 meals per day (2.231 times), consuming supplements (5.213 times) and consuming medicines (3.442 times).

DISCUSSION

Healthy Hajj pilgrims are the basis for good readiness to carry out the Hajj pilgrimage optimally. Healthy Hajj pilgrims will focus on the congregation in order to hope for blessing and appreciation from Allah SWT.¹⁷ Hajj pilgrims from Indonesia based on the characteristics of respondents showed that they were generally physically healthy and of productive age when performing the Hajj. Respondents are

financially capable, because in general they are still actively working. Even though there are health problems, they are still in the mild category. The health problems faced can be quickly resolved by providing general medicines that are brought, rest or assistance from family/friends from the Hajj group. information captured on diseases that Hajj pilgrims complain about, such as flu, coughs, fever, fatigue, pain, lack of appetite, red eyes. Indonesian Hajj pilgrims are aware that, under any circumstances, the majority (81%) eat at least 3 times a day, but 90% of them consume incomplete food to meet their calorie and nutritional needs during the Hajj pilgrimage. Based on the results of the open question questionnaire, consumption was incomplete for the following reasons: 38% were not used to consuming bread and potatoes, some wanted processed noodles, while rice was not like in Indonesia. The types of side dishes for the Hajj pilgrimage are the same, namely fish, chicken eggs, meat but they want to be prepared using traditional Indonesian dishes, apart from that some want tempeh and tofu. Some congregants said that fruit and vegetables were available in salad form and tasted sour. Some of the congregation wanted spinach or kale and fruit in the form of papaya and mango. Fruits native to the Arab world, namely grapes, apples, pears, olives and plums, are less popular, only 1% of the congregation consume them. Other reasons for consuming incomplete food are because you are in a hurry, sleepy, hard to digest, tired, afraid to go to the toilet often, because you have a history of illness).

Hajj pilgrims have taken supplements and medicines which they feel are sufficient to maintain their own health. Meanwhile, the other 20% of Hajj pilgrims who consume twice a day and have incomplete nutritional intake may have compromised health or lack of appetite or old age. Energy adequacy for individuals, especially Hajj pilgrims, is recommended to consume between 45%-65% of calories from carbohydrates, 10%-35% from protein, and 20%-35% from fat. Higher fat levels can reduce consumption of other foods, thus having a negative impact on overall energy intake.¹⁸

Optimal nutrition and health policies for Indonesian Hajj pilgrims are recommended to consider important physiological, neurological and hormonal aspects throughout the life cycle that impact nutritional needs. In contrast to men, appropriate nutrition policies aim not only to avoid malnutrition, but also to improve health and minimize the risk of chronic disease. Apart from providing calories to achieve optimal nutrition, policy programs also take into account cultural, socio-economic and geographical differences, in this case the Hajj pilgrim community.¹⁹

It is difficult to obtain literature related to the nutritional intake of Hajj pilgrims which is shown in table 3. We obtained similar previous literature, namely the relationship between nutritional knowledge, level of nutritional adequacy and physical activity with the

nutritional status of teachers at Dramaga Bogor State Junior High School 1 (SMP). The results showed that there was no significant relationship between the level of energy adequacy, the level of protein adequacy, the level of fat adequacy, and the level of carbohydrate adequacy with nutritional status in 74.3% of women; average middle to late adulthood (68.6%); as a Civil Servant, the average working hours is 6-8 hours; and obesity nutritional status (51.4%). The level of energy consumption is classified as a moderate deficit, a mild protein deficit, more fat, and sufficient carbohydrates. Average level of physical activity of subjects on light holidays and moderate school days. Most of the subjects had a very poor fitness level (71.4%).²⁰ The similarity in this research is that protective factors related to nutritional intake occur in women, aged 50 years and have health compliance.

Table 3 also shows that there are protective factors for Hajj pilgrims who consume supplements. This research is in line with research conducted on consumers who proactively consume nutritional supplements as an alternative preventative method for maintaining health in the United States. National Health and Nutrition Examination Survey (NHANES) data to determine whether nutritional supplement consumers differ from non-consumers of nutritional supplements. based on individual Healthy Eating Index (HEI-2010) scores. The analysis showed a negative relationship between supplement intake and BMI but it did not have a significant effect on the quality of a person's diet. Individuals proactively invest in their health by taking nutritional supplements rather than improving diet quality through more nutritious food choices.²¹ This research is also in line with the relationship between protective factors in individuals who consume drugs and nutritional intake. Previous research stated that there is a possibility of drug-food interactions, where some drugs affect nutritional status. There is a need to educate individuals (hajj pilgrims) about correct eating patterns, to maximize the effectiveness and safety of drug therapy while maintaining/improving nutritional status. These recommendations will increase the efficacy of pharmacological treatment while preventing patients from unwanted drug effects.²²

This study shows a protective factor in the frequency of eating 3 times against incomplete nutritional intake. This is different from previous research which did not link it to complete and incomplete nutrition. Previous research analysis suggests that a regular eating pattern including eating breakfast, consuming larger amounts of energy in the morning, reducing meal frequency (i.e. 2-3 meals/day), and regular fasting periods can provide physiological benefits such as reducing inflammation, improving circadian rhythms, increasing autophagy and resistance to stress, as well as modulating gut microbiota.²³ In this literature there is no explanation about the quality of diet.

Other research mentions comorbidities and complete

nutrition which supports this research. Research on malnutrition and weight loss occurs frequently in COPD outpatients in Vietnam. Most patients have inadequate food intake and low quality of life. Nutritional counseling including increasing the number of meals per day with a focus on foods rich in energy and protein can help improve the nutritional status and quality of life of COPD patients.²⁴ Policies related to protective factors for comorbidities in Hajj pilgrims need to be given attention in improving the nutritional status and quality of the Hajj pilgrimage.

Carbohydrates are a necessary substrate for high-intensity physical movement activities, including the Hajj activity. The use of carbohydrates during physical activity plays an important role in the survival of body cells, genes and traits that regulate physical activity. Carbohydrate metabolism plays a role in producing and storing energy. Therefore, a balanced carbohydrate intake is needed. Physical activity in the form of the Hajj pilgrimage has a beneficial effect on Hajj pilgrims to help control glucose which is disturbed due to the homeostasis of metabolic diseases. Hajj activities can increase glucose absorption and insulin sensitivity in healthy people. When performing the Hajj, the energy used by the human body mostly comes from the oxidation of carbohydrates and fats. Blood glucose, free plasma fatty acids, muscle glycogen, and intramuscular triglycerides are the main substrate sources for energy production in the physical activity of Hajj pilgrims. The physical activity of Hajj pilgrims increases energy demands on muscles, by increasing ATP production. So, the main energy sources during the Hajj pilgrims' physical activity are carbohydrates and fat. Sources of carbohydrates for muscles include blood glucose, muscle glycogen and liver glycogen.²⁵

Protein plays a role in maintaining skeletal muscle mass which is very constant throughout most of an adult's life. Muscles as one of the physical means of movement for Hajj pilgrims are in a balance between amino acid consumption and the increase produced through muscle protein synthesis that occurs between meals. Protein balance in the form of essential amino acids (threonine, valine, leucine, isoleucine, lysine, tryptophan, phenylalanine, methionine and histidine) to maintain the composition of muscle mass during the physical activity of Hajj pilgrims.²⁶

Protein consumption functions provide essential amino acids for the synthesis of new proteins, forming hormone and enzymes proteins involved in metabolic functions; forms structural protein in the form of actinmyosin as a building block for muscles; Antibody proteins involved in the immune response. When the protein metabolic pathway is in a threshold or decreases with age or decreases due to physical activities such as pilgrims. Recommended daily consumption of total protein 0.8g/ kg body weight. Consumption of food in the form of protein 3 times a day, produces a good protein intake for macronutrient intake that

can be received in an effort to optimize metabolism for health.²⁷

Therefore the prerequisites for getting physical health must be to eat adequate amounts of calories and perfect nutrition. This is in line with the concept of Istitha'ah in the view of the scholars of the four schools of pilgrims (Hambali, Hanafi, Maliki and Shafi'i) that in addition to Istitha'ah Sciences, financial istitha'ah and Istitha'ah security, a prospective pilgrims / umrah also must have physical Istitha'ah and health. Physical Istitha'ah is one of the mandatory requirements in the Hajj and Umrah. All pillars and obligatory hajj are closely related to physical abilities and health. The data above also shows there is a small portion (20%) of the congregation who experience health problems and lack of appetite, this is common in congregations with old age. In connection with this advanced age, there is a Hadith of the Prophet Muhammad, narrated by Ibn Abbas.²⁸

"There was a woman from Khatham asking, O Messenger of Allah, verily my father is an old man, but he still has the obligation of pilgrimage, while he is unable to sit on a camel. Then Rasulullah SAW said, "If so, please present it," (HR.Moslem).

As many as 87% of Hajj pilgrims consume food with incomplete composition. This data consumes incomplete food, some 95 pilgrims over 50 years old. This is caused by several factors, including health problems and decreased appetite. Rasulullah SAW taught the concept of eating so as to maintain a balanced diet;

Adam's children are not in a worse place than their stomachs. It is enough for them to bribe so that their bodies can function. If no other way is found, then he can fill his stomach with one-third for food, one-third for drink, and one-third for breathing. (HR. Ibn Majjah and Ibn Hibban)

Vitamins are a group of organic compounds that are important for normal physiological function but are not synthesized endogenously by the body so they must be consumed and are needed in small amounts. Although most vitamins come from plants, some are consumed indirectly from animals, found in meat, milk and eggs and are bioactive (cheese or yogurt).²⁹ Vitamins A, C and E, are very important as anti-inflammatory and antioxidant effects because of their important role in improving immune function and play a role in regulating cellular and humoral immune responses, play a role in the learning process and memory storage, antioxidants in the brain and antioxidants for cell defense.^{30,31} Hajj pilgrims whose memory declines due to fatigue from participating in the Hajj pilgrimage and hot conditions can be stabilized through vitamin intake. For Hajj pilgrims, vitamin B complex is important to stimulate increased body metabolism so as to produce maximum energy during the Hajj pilgrimage. Vitamin B consists of a group of eight water-soluble vitamins which have important functions,

roles that are closely related to each other in cellular metabolic function, acting as co-enzymes in various catabolic and anabolic enzymatic reactions. Vitamin B is very important for optimal physiological and neurological function to maintain body health.²⁹ Minerals and water that are not consumed by Hajj pilgrims are a failure to fulfill the Hajj pilgrims' nutritional requirements. Apart from drinking water, minerals and water can be obtained from vegetables and fruit. Not consuming vegetables and fruit reduces the amount of minerals and water needed by the body. Water is a very important component for the body. For the body to stay healthy, each individual must be able to maintain fluid balance in his body. To maintain fluid balance in the body, the amount of fluid that enters (intake) must be balanced with the fluid that comes out (output). The amount of fluid that comes out of the body is very dependent on various factors. Internal factors that influence the occurrence of body fluid imbalance include age, sex, education level, Body Mass Index (BMI), comorbidity, mobility and cognitive status. External factors that influence are climate conditions and the availability of healthy water. Indonesian pilgrims are in very different climatic conditions in Mecca and Medina which have extreme climates. In addition, pilgrimage ritual activities require energy intensive, thereby increasing the risk of dehydration and fatigue.³²

Water is also important in thermoregulation, as a solvent for biochemical reactions or the body's metabolism, to maintain vascular volume, transportation media to supply nutrients and excretion of substances that are not needed by the body. The body's water deficit can endanger health, it causes disruption of other organs.³³ Dehydration in pilgrims is usually caused by loss of fluids due to cold weather at night in Mecca / Medina which causes increased diuretic hormones, secretory diarrhea caused by different food digestive habits and insufficient fluid intake to compensate for normal fluid loss every day (eg loss of pure water daily due to respiration and transcutaneous evaporation) and very hot weather during the day and made worse by the loss of high sweat during carrying out the rituals of the pilgrimage. Most pilgrims consume either bottled mineral water or zam-zam water and some drink sweet and even very sweet like honey and syrup. However, a daily intake of 1.5-2 liters of water must be guaranteed, because good hydration is very important to maintain body water balance, although needs can vary between individuals because they are influenced by age, physical activity, personal circumstances and weather conditions. The water consumed is either processed or not, the purpose is to obtain a source of drinks, food and minerals. The health effects of mineral water will be different in physiological and pathological conditions.³⁴ The limitation of this research is that it does not measure the quantitative amount of nutrients consumed and the health impact of consuming incomplete nutrients.

CONCLUSION

Protective factors for Indonesian Hajj pilgrims who consume complete nutrition in female gender, age over 50 years, pilgrims departing in 2016-2020, married status, retired, have health compliance, eat 3 times a day, take supplements and take medication. This research shows that the majority of Indonesian Hajj pilgrims during the Hajj or Umrah journey consume incomplete nutrition. So there is a need for education to prospective Hajj pilgrims in the future about the need for Hajj pilgrims to be aware of the need for macronutrients and micronutrients during the Hajj pilgrimage. Information from this research is important for Hajj or Umrah organizers to determine policies in overcoming Hajj health problems using approaches to reducing immunity, energy adequacy, physical health and religious approaches.

CONFLICT OF INTEREST

All authors in this article declare there is no conflict of interest.

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