**Can patient's nutritional status and nationality predict the cause of admission and hospital length of stay of Hajj patients admitted at the medical department in a tertiary hospital, Makkah?**

**Wael A. Z. Shahin1,2, Mohammed H. Aly1,3, Mamdouh A. Kalkatawi1**

1 Medical department, Al Noor Specialist Hospital, Makkah, KSA. 2 Ass. Prof. Gastroenterology department, Benha Faculty of Medicine, Benha University, Benha, Egypt.3 Lecturer of General Medicine, South Valley Faculty of Medicine, South Valley University, Qena, Egypt.

Abstract

 Every year, Makkah hosts millions of Muslims from around the world to perform hajj (pilgrimage); this increases the burden on the health care facilities. The aim of the study was to assess the nutritional status of Hajj patients admitted at the medical department, Al Noor hospital, Makkah, and its relation to the cause of admission and hospital length of stay (HLOS). Patients and methods: 163 patients were admitted during the hajj season (1st - 15th Zul Hejjah, 1430). All patients were studied as regards the demographic characters, nutritional status, hospital length of stay and cause of admission. Results: The mean age of patients was 59.4 ± 11 yrs, and 57.7% of patients were males. Mean BMI was 23.8 ± 5.6 kg/m2,(45.4% had normal nutrition status, 23.9% had under-nutrition status, 18% were overweight and 12.7% were obese). The commonest cause of admission was respiratory diseases (44.2%) followed by Gastrointestinal diseases (22.1%), Neurological diseases (11%), Diabetes Mellitus complications (10.4%) and other diagnosis (12.3%). The mean HLOS was 3.9±2.47 days and prolonged HLOS (more than 5 days) was reported in 17.8% of patients. Length of stay is significantly more in females compared to males (26% vs11.7%). The shortest duration of HLOS was in normal BMI patients (3.64±2 days), while the longest was with the obese patients (4.52±4.1 days). Patients were coming from 34 countries (6 groups): 31.9% (South Asia), 25.8% (Arabic countries), 23.3% (South East Asia), 11.7% (central Asia), 4.3% (sub-Saharan Africa) and 3% from other areas. There was a statistically significant increase of undernutrition in patients aged 60 ≥ years (84.6% versus 15.4%). MAC, TSF AND MAMC are good indicators of nutrition status (p 0.00). Undernutrition was significantly more in African patients (57%) followed by South East Asian (39.5%) while it was less than 15% in other groups. Also, in undernourished patients, respiratory diseases were more (35%) and neurological diseases were less (5.6%) and in overweight and obese patients, the respiratory diseases were less (21%) and the neurological diseases were more common (61% ). Conclusion: In 1430 Hajj season, 163 patients were admitted at the medical department. The mean age was 59.4 ± 11 yrs, males were more than females (57.7% vs 42.3), 32% came from south Asia, undernutrition was found in 23.9% of patients, while 12.7% were obese, respiratory diseases were the commonest cause of admission (44.2%); it was more common in undernourished and less in obese patients in the reverse to neurological disease. Mean hospital length of stay was 3.9±2.47 days, HLOS was more prolonged in females and in obese patients.

**Introduction**

Hajj (holy pilgrimage) is a cosmopolitan conference, which takes place annually in the 12th month of the Islamic lunar calendar, it is one of the largest, most culturally and geographically diverse mass gatherings in the world. Makkah hosts over 2 million of Muslims coming from more than 140 countries.( Memish et al., 2012).

Performance of the Hajj is physically demanding. Extreme physical stressors such as sun exposure, crowding and traffic congestions increase health risks. Also, pilgrims tend to be older and many have medical comorbidities (Gautret et al., 2009), these factors exacerbate existing risk for disease, fluid and electrolyte abnormalities, and respiratory and other infectious diseases (Mandourah et al., 2012)

Pilgrims are coming from all around the world differing in their health and nutrition states. According to the Medical Subject Headings (MeSH®) nutrition status is the state of the body in relation to the consumption and utilization of nutrients and malnutrition is defined by the European Society of Clinical Nutrition and Metabolism (ESPEN) as “a state of nutrition in which a deficiency or excess (or imbalance) of energy, protein, and other nutrients causes measurable adverse effects on tissue/body form (body shape, size and composition) and function, and clinical outcome” (Lochs et al., 2006)

The purpose of nutritional screening is to rapidly identify patients at high nutritional risk. The purpose of nutritional assessment, however, is to define a patient’s nutritional status, to define clinically relevant malnutrition and to monitor changes in nutritional status (Kyle and Coss-Bu, 2010)

 The KSA provides free healthcare to all pilgrims during the Hajj. In 2009, the KSA Ministry of Health prepared 24 hospitals with a total bed capacity of 4,964 beds. (Memish, 2010). Hospital length of stay (LOS) has been used as a surrogate marker for patients’ well-being during hospital treatment and as an indicator of health care efficiency. (Murphy and Noetscher, 1999). Hospital length of stay (LOS) is defined by the Mosby's Medical Dictionary as the period of time a patient remains in a hospital or other health care facility as an inpatient.

The aim of the study was to assess the demographic characters and the nutritional status of Hajj patients admitted at the medical department, Al Noor hospital, Makkah, and its relation to the cause of admission and hospital length of stay (HLOS).

**Patients and methods**

This is a prospective, descriptive cross-sectional study including 163 consecutive Hajj patients admitted at the medical department, Al Noor Specialist Hospital, which is a 550-bed tertiary care teaching hospital, in Makkah, KSA. The inclusion criteria included all adult non-Saudi hajj patients, admitted during the period (1 to 20/12/1430 H – 18/11 to 7/12/2009). All patients were evaluated for demographic characters: age, sex, and nationality; cause of admission, nutritional status including anthropometric measures and hospital length of stay:

1. The cause of admission includes:

A. Respiratory diseases: mainly respiratory tract infections and respiratory failure.

B. Gastroenterology cases: mainly GI bleeding and liver diseases.

C. Neurology cases: mainly cerebrovascular stroke patients.

D. Diabetic patients: mainly the complications of hyper or hypoglycemic states.

E. Others: other diagnosis as chronic renal failure cases.

Cardiac patients were admitted in the cardiology department.

1. Nationality: patients were classified according to their nationality into 6 groups; Arabic countries, African (non-Arabic), South Asian, South East Asian, Central Asian and others. (table 1)
2. Length of stay: the number of nights of hospital admission, it is considered prolonged if more than 5 days.

 The anthropometric indicators were:

1. Weight (W) using with an electronic scale with a maximum capacity of 150 kg and accuracy of 0.1 kg and 200 cm for height.
2. Height (H): within the electronic scale max 200 cm approximated to the nearest cm.
3. Mid arm circumference (MAC).
4. Triceps skin fold thickness (TSF).
5. Body Mass Index (BMI): weight in Kg/ (height in meters)2 (kg/m2).
6. Mid Arm Muscle Circumference (MAMC): MAMC = MAC − (0.314 × TSF).

 According to the World Health Organization criteria (WHO) (WHO, 1998), the

 Nutritional Status was classified according to the BMI as follows:

 BMI <18.5 = Under-nutrition; 18.5 < BMI < 24.9 = Normal; 25 < BMI < 29.9 =

 Overweight; BMI > 30 = Obese. The BMI for elderly patients (60 years or older) was

 classified according to Lipschitz ( Lipschitz DA. 1994) BMI < 22 = Under-nutrition;

 22 < BMI < 27 = Normal; 27< BMI < 29.9 = Overweight and BMI > 30 = Obese.

 The skin fold was measured with a measurement range of 0-60 mm and accuracy of ±

 1.0 mm, and a 150-cm inelastic tape measure with accuracy of 0.1 cm was used for the

 other measures. MAC and TSF (skin-fold thickness) were normalized according to

 Frisancho AR. 1981, since they represent different gender and age, as: data x 100,

 divided by data of 50th percentile. The data were transformed into dichotomous

 variables: TSF < 70% (severe depletion) or TSF > 70% (not severe depletion) and MAC

 < 25 cm (with depletion) or MAC > 25 cm (without depletion), as previously defined

 and used by Powell-Tuck.( Powell-Tuck J and Hennessy EM2003).

Types of diseases were classified to respiratory, digestive, neurological, diabetic or others.

 Age was stratified as adult (< 60y) and elderly (60y or more). The LOS was categorized into two groups: up to 5 days (short) and >5 days (long).

Reference Values for Mid-arm Muscle Circumference

|  |  |  |
| --- | --- | --- |
| Age | 50th Male | 50th females |
| 18 - 24 | 27.2 | 20.6 |
| 25 - 34 | 28.0 | 21.4 |
| 35 - 44 | 28.7 | 22 |
| 45 - 54 | 28.1 | 22.2 |
| 55 - 64 | 27.9 | 22.6 |
| 65 - 74 | 26.9 | 22.5 |

Developed from data collected during the NHANES I, 1974. (Bishop, C.W., et al., 1981.)

Reference Values for Mid-arm Muscle Circumference

Males (cm percentile)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Age | 10th | 25th | 50th | 75th | 90th |
| 18 - 24 | 24.4 | 25.8 | 27.2 | 28.9 | 30.8 |
| 25 - 34 | 25.3 | 26.5 | 28.0 | 30.0 | 31.7 |
| 35 - 44 | 25.6 | 27.1 | 28.7 | 30.3 | 32.1 |
| 45 - 54 | 24.9 | 26.5 | 28.1 | 29.8 | 31.5 |
| 55 - 64 | 24.4 | 26.2 | 27.9 | 29.6 | 31.0 |
| 65 - 74 | 23.7 | 25.3 | 26.9 | 28.5 | 29.9 |

Females (cm percentile)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Age | 10th | 25th | 50th | 75th | 90th |
| 18 - 24 | 18.5 | 19.4 | 20.6 | 22.1 | 23.6 |
| 25 - 34 | 18.9 | 20 | 21.4 | 22.9 | 24.9 |
| 35 - 44 | 19.2 | 20.6 | 22 | 24 | 26.1 |
| 45 - 54 | 19.5 | 20.7 | 22.2 | 24.3 | 26.6 |
| 55 - 64 | 19.5 | 20.8 | 22.6 | 24.4 | 26.3 |
| 65 - 74 | 19.5 | 20.8 | 22.5 | 24.4 | 26.5 |

Developed from data collected during the NHANES I, 1974. Bishop, C.W., et al., 1981.

*Statistical analysis*

 Demographic, nutritional parameters, nationality and cause of admission data were collected. IBM SPSS Statistics 17 program was used for data analysis. Dichotomous or categorical variables were presented as number and percentage. Continuous variables were presented as mean ± standard deviation. Univariate analysis by using Pearson Chi square test was used to compare dichotomous or categorical variables, and two tailed t test for continuous variables. Dichotomous variables considered to be risk factors for longer length (undernutrition, age, gender and anthropometric variables were analyzed using a logistic regression model. Significance was considered at P value 0.05 or less.

**Results**

 The aim of the study was to assess the demographic characters and nutritional status of Hajj patients admitted at the medical department and its relation to the cause of admission and hospital length of stay. This may help the local health providers in their health planes during hajj season. One hundred sixty three patients from 34 countries were admitted at the medical department during the hajj season 1430 (1 to 15/12/1430 H – 18/11 to 2/12/2009). The mean age of patients was 59.4 ± 11 yrs., and 57.7% of patients were males. More than half of the patients (52.1%) were old age patients (age ≥ 60 yrs.). Mean BMI was 23.8 ± 5.6 kg/m2). No significant difference was found between male and female patients in different nutrition states (p 0.245) The mean HLOS was 3.9±2.47 days and prolonged HLOS (more than 5 days) was reported in 21 patients (17.8%). HLOS is prolonged in obese patients but not reaching the level of significance. Respiratory diseases are the commonest cause of admission (44.2%). Under-nutrition was detected in 39 patients (23.9%), thirty three of them were elderly patients (84.6%).

Fig (1): General parameters of pilgrims admitted to the medical floor:

Figure (2) Nutritional status of Hajj patients admitted to the medical department:

Figure (3) cause of admission of hajj patients admitted to the medical department.

Figure (4): Nationality of Hajji patients admitted in the medical department

Table (1): Comparison between patients according to their Nutritional states

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | Undernutrition (39 pt) 23.9% | Normal (74 pt) 45.4% | Overweight (29pt)17.8% | Obese (21 pt)12.9% | Pearson chi square P value |
| Age (yr) (m ± std. dev) | 65.8±10 | 58.4±10.8 | 55.6±8.6 | 56.3±12.1 | 0.057 |
| Age ≥ 60yrs (85 pt) (No, %) | 33/39(84.6%) | 38/74(51.4%) | 7/29(24.1%) | 7/21(33.3%) | 0.004 |
| **Nutrition parameters** |
| BMI (Kg/m2) (m ± std. dev) | 17.6±2.1 | 23±2 | 27.1±1.8 | 33.8±5.3 | 0.000 |
| MAC (cm) (m ± std. dev) | 21.7±2.8 | 26.2±2.7 | 28.6±2.9 | 32.7±4.5 | 0.000 |
| TSF (cm) (m ± std. dev) | 0.69±0.3 | 1.15±0.5 | 1.32±0.5 | 1.84±.9 | 0.000 |
| MAMC (cm) (m ± std. dev) | 19.5±2.5 | 22.6±2.7 | 24.5±2.7 | 26.9±3.3 | 0.003 |
| **LOS** |  |
| Los (days) m ± std. dev | 3.77±2.1 | 3.64±2 | 4.4±2.4 | 4.52±4.1 | 0.078 |
| **Nationality** |  |
| South Asian (52 pt) (No, %) | 14/52 (26.9%) | 22/52 (42.3%) | 11/52 (21.2%) | 5/52 (9.6%) | 0.017 |
| Arabic (42 pt) (No, %) | 6/42 (14.3%) | 20/42 (47.6%) | 10/42 (23.8%) | 6/42 (14.3%) |
| S. E. Asian (38) (No, %) | 15/38 (39.5%) | 18/38 (47.5%) | 3/38 (7.9%) | 2/38 (5.1%) |
| Central Asian (19 pt) (No, %) | 0/19 (0%) | 10/19 (52.6%) | 4/19 (21.1%) | 5/19 (26.3%) |
| African (7 pt) (No, %) | 4/7 (57%) | 2/7 (29%) | 1/7 (14%) | 0/7 (0%) |
| Others (5 pt) (No, %) | 0/5 (0%) | 2/5 (40%) | 1/5 (20%) | 2/5 (40%) |
| **Cause of admission** |
| Gastroenterology (36 pt) (No, %) | 6/36 (16.7%) | 20/36 (55.6%) | 7/36 (19.4%) | 3/36 (8.3%) | 0.017 |
| Respiratory (72 pt) (No, %) | 25/72 (34.8%) | 32/72 (44.4%) | 7/72 (9.7%) | 8/72 (11.1%) |
| Neurology (18 pt) (no, %) | 1/18 (5.6%) | 6/18 (33.3%) | 5/18 (27.8%) | 6/18 (33.3%) |
|  Diabetics (17 pt) (No, %) | 3/17 (17.7%) | 8/17 (47%) | 6/17 (35.3%) | 0/17 (0%) |
| Others (20 pt) (No, %) | 4/20 (20%) | 8/20 (40%) | 4/20 (20%) | 4/20 (20%) |

**Table (2) comparison between patients according their hospital length of stay:**

|  |  |  |  |
| --- | --- | --- | --- |
| P value chi-Square | LOS 5 days or less (134pt) (82.2%) | LOS >5 days (29 pt) (17.8%) |  |
| 0.017 | 83/134 (62%)51/134(38%) | 11/29 (38%)18/29(62%) | Male (94 pt) (No, %)Female (69 pt) |
| **Nutrition status** |
| 0.763 | 31/39(79.5%) | 8/39 (20.5%) | Underweight (39 pt) (No, %) |
| 62/74 (83.8%) | 12/74 (16.2%) | Normal (74 pt) (No, %) |
| 25/29 (86.2%) | 4/29 (13.8%) | Overweight (29 pt)(No, %) |
| 16/21 (76.2%) | 5/21 (23.8%) | Obese (21 pt) (No, %) |
| **Cause of admission** |
| 0.152 | 27/36 (75%) | 9/36(25%) | Gastroenterology (36 pt) (No, %) |
| 61/72 (84.7%) | 11/72 (15.3%) | Respiratory (72 pt) (No, %) |
| 17/18(94.4%) | 1/18 (5.6%) | Neurology (18 pt) (No, %) |
| 16/17 (94.1%) | 1/17(5.9%) | Diabetics (17 pt) (No, %) |
| 13/20 (65%) | 7/20 (35%) | Others (20 pt) (No, %) |
|  | **Nationality** |
| 0.593 | 36/42 (85.7%) | 6/42 (14.3%) | **Arabic (42** pt) (No, %) |
| 4/5 (80%) | 1/5 (20%) | **African (5** pt) (No, %) |
| 44/52 (84.6%) | 8/52 (15.4%) | **South Asian(52** pt) (No, %) |
| 28/38 (73.7%) | 10/38 (26.3%) | **S. E. Asian (38** pt) (No, %) |
| 17/19 (89.5%) | 2/19 (10.5%) | **Central Asian(19)** (pt) (No, %) |
| 5/7 (71.4%) | 2/7 (28.6%) | **Others (7)** (pt) (No, %) |

**Table (3): Comparison between patients according to nationality and cause of admission..**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **parameter** | **South Asian (52pt) 31.9%** | **Arabic (42pt)****25.8%** | **S. E. Asian****(38pt)****23.3%** | **Central Asian(19pt) 11.7%** | ***African (7pt)******4.3%*** | ***Others (5pt)******3.1%*** | **P value** |
| **Gastroenterology** (36 pt) (No, %) | **10/ 52 (19.2%)** | **9/ 42****(%21.4)** | **12/ 38 (31.6%)** | **3/19 (15.8%)** | **1/7 (14.3%)** | **1/ 5 (20%)** | **Per chi** **p 0.001** |
| **Respiratory** (72 pt) (No, %) | **24/52 (46.1%)** | **14/42 (33.3%)** | **18/38 (47.4%)** | **9/19 (47.4%)** | **5/7** **(71.4%)** | **2/5 (40%)** |
| **Neurology** (18 pt) (No, %) | **4/52 (7.7%)** | **9/42** **(21.4%)** | **0/38** **(0%)** | **4/19 (21.1%)** | **0/7** **(0%)** | **1/5 (20%)** |
| **Diabetics** (17 pt) (No, %) | **7/52 (13.5%)** | **7/42 (16.7%)** | **2/38** **(5.2%)** | **1/19****(5.3%)** | **0/7** **(0%)** | **0/5** **(0%)** |
| **Others** (20 pt) (No, %) | **7/52****(13.5%)** | **3/42** **(7.2%)** | **6/38****(15.8%)** | **2/19****(10.5%)** | **1/7 (14.3%)** | **1/5 (20%)** |

 The aim of the study was to assess the demographic character and nutritional status of Hajj patients admitted at the medical department and its relation to the cause of admission and hospital Length of Stay which may help the local health providers in their health planes during hajj season.

The mean age was 59.4 yrs., mean BMI was 23.8 kg/m2 and mean HLOS was 3.9 days. Around 52% of patients were 60 years or older, 57.7% of patients were males and 17.8% of patients had prolonged HLOS (Fig 1).

Fig (2) showed the nutritional status of all hajji patients where 23.9% of them had under-nutrition and 12.7% of patients were obese.

Fig (3) the commonest cause of admission was respiratory diseases (44.2%) followed by gastrointestinal diseases (22.1%), neurological diseases (11%) and diabetes mellitus (10.4%).

Fig (4) showed that the largest group of hajj patients were from South Asia (31.9%), followed by Arabic countries (25.8%) and were in details as follows:

1. South Asian countries (52): (India 26, Pakistan 13, Afghanistan 4, Bangladesh 4, Iran 4, Sri lanka 1(,

2. Arabic countries (42): (Egypt 12, morocco 7, Sudan 7, Iraq 6, Syria 3, Algeria 2, Emirates 1, Lebanon 1, Libya 1, Somalia 1, Yemen 1),

3. S. E. Asian countries (38): (Indonesia 26, Philippine 4, china 4, Malaysia 3, Burma 1),

4. Central and West Asian countries (19): (turkey 12, Kazakhstan 2, Russia2, Uzbekistan 2, Kirghizstan 1),

5. African countries (7): (Nigeria 4, Burkina Faso 2, South Africa 1),

6. Other countries (5): (Britain 2, Norway 1, New Zealand 1, German 1).

Table (1) showed that there was a statistically significant difference between nutrition state and elderly patients (age ≥ 60 yrs) where the elderly patients constitute 84.6% of the undernourished patients and one third of obese patients. There a significant difference between Mid arm circumference, mid arm skin fold and mid arm muscle circumference and nutrition state. The shortest duration of HLOS was in patients with normal nutrition status (3.64±2 days) and the longest was in obese patients (4.52±4.1 days) but the difference was statistically insignificant.

There is a statistically significant difference between nutrition status and nationality where under-nutrition was more common in Africans (57%), and S.E. Asian (39.5%) and less common in Arabic patients (14.3%) and Central Asian and Western patients (0%). On the other hand, the percentage of obesity was 0% in Africans, and highest in central Asian and westerns. The nutrition status significantly affect the cause of admission; Under-nutrition was commoner in patients presented with respiratory diseases (35% in undernourished patients vs 11% in obese patients), while obesity was commoner in patients presented with neurological diseases (5.6% undernourished vs 33.3% obese).

In table (2) Prolonged Length of stay was significantly more in females ( 62% vs 38% p 0.017) while no significant difference between the short or prolonged HLOS as regards the nutrition status, cause of admission and patient's nationality.

In table (3) showed that there is a significant difference between the cause of admission as regards the patient's nationality (p 0.001), none of the SE Asian nor the African had neurological disease while it is found in around 20% of the Arabic, Central Asian and western patients. Respiratory diseases were more in Africans (71.4%), south, S.E. and central Asian patients (47%).

**Discussion**

 The aim of this study was to elucidate the pattern of demographic characters and nutritional status of Hajj patients admitted at the medical floor and its relation to HLOS and cause of admission in order to help health policy makers to plan the future services during hajj season.

On reviewing the literatures, we found national reports studying the demographic characters and the cause of admission but we could not find studies dealing with the nutrition status or HLOS of hajj patients.

In the present study the mean age of patients was 59.4 ± 11 yrs., and 57.7% of patients were males. More than half of the patients (52.1%) were old age patients (age ≥ 60 yrs.) and respiratory diseases are the commonest cause of admission (44.2%) and gastrointestinal diseases in 22% of patients. Approximately 32% of patients came from South Asia while 25.8% came from Arabic countries.

In a study done by Saeed et al, 2003, on the hajj patients admitted at medical departments in 4 hospitals in mina and Arafat (Al-Mashaer), 9th and 10th of zul Hijjah 1422. A cohort of 160 patients was collected; Males constituted 62% with the median age of 60 +/- 15years. The respiratory system was the most commonly affected (57%), and gastrointestinal tract (GIT) in 6.3% of cases. Most of the admissions were from Arab countries (45.6%), Indian subcontinent (17%), non-Arab African countries (11.3%), and Indonesia and the Far East (11.3%). Another study published in 2007 by khan et al. It included 689 patients, belonging to 49 countries, with mean age of 62 years and male: female ratios of 1.8:1. In the same year (2007),a study published by Madani et al., on 140 hajj patients admitted to ICUs, fifty four percent of patients were older than 60 years and 67.6% of patients were men, pneumonia was the admitting diagnosis in 22% of patients.

Shafi et al., 2008 reported 'Hajj cough' is the most frequently reported complaint. Same finding was reported by Yousaf et al., 1995, Al-Ghamdi et al. 2003, Balkhy et al., 2004, Shakir et al., 2006, Madani et al., 2007 and Alzeer 2009. Pneumonia is a common illness that is life-threatening to the elderly, especially those with comorbidities such as diabetes or hypertension [Mandourah et al., 2012). One-third of Indonesian pilgrim mortality was attributed to respiratory diseases. ( Masdalina Pane et al., 2013) similar findings were reported by the Iranian hajj report (Meysamie et al., 2006).

In the present study, it is found that 23.9% of Hajj patients had under-nutrition and 12.7% of them had obesity and 84.6% of undernourished patients were elderly patients. MUAC, TSF and MAMC were good indicators of nutritional status. Under-nutrition was commoner in patients presented with respiratory diseases (35% under nourished vs 11% obese), while obesity was commoner in patients presented with neurological diseases (5.6% undernourished vs 33.3% obese). In African and SE Asian hajj patients, neurological diseases were rare while respiratory diseases were common in the reverse to central Asian and western hajj patients, this may be related to the prevalence of under-nutrition.

Many international reports were found studying the prevalence of malnutrition in hospitalized patients and its relation to the admission diagnosis. Reports started as early as the seventies of the last century and found that thirty to fifty percent of hospitalized patients may have malnutrition (Butterworth , 1974, Bistrian , et al., 1976, Weinsier et al., 1979 and Waitzberg , et al., 2001), and despite its high prevalence, medical awareness of the patients’ nutritional status was lacking (McWhirter and Pennington 1994 and Waitzberg , et al., 2001)

This malnutrition was found to be prevalent even in developed countries with high standard of life as Sweden (Albiin, et al., 1982), where the nutritional status was assessed in 75 consecutive patients acutely admitted to a general medical ward and obesity was found in 9% and under-nutrition was found in 22% of patients. And in a study from Poland, (Dzieniszewski et al., 2005) malnutrition risk demonstrated by BMI was observed in 10.43% of patients. Vlaming et al., 2001, assessed the nutrition of 1561 patients on emergency admission to hospital; they found that 18.3% of patients were undernourished.

In a national survey from Netherlands (Kruizenga et al., 2003) Screening of nutritional status in The Netherlands and conducted on 7,367 patients, approximately 25% of patients in all medical fields were categorized as moderately or severely malnourished. It was found that 12% of all patients appeared to be malnourished and 13% were at risk of malnutrition. . Elderly patients were more at risk of malnutrition. Also, a Brazilian study done by Leandro-Merhi and Braga de Aquino, (2010), they studied the Nutritional status and length of hospital stay for surgical patients. Malnutrition was diagnosed in 14.1%; in only 2.97% of the adult patients (aged ≤ 59 years) and in 36.6% of the elderly patients (aged 60 ≥ years)

In this study, Prolonged Length of stay was significantly more in females (62% vs 38% p 0.017), while no significant difference between HLOS and the nutrition status, cause of admission and patient's nationality. These results need to be repeated on larger scale as many reports was different from these results, this may be explained by the small number of patients and the fact that hajj patients are not homogenous group..

In an American study published in 1997 by Chima et al., Median HLOS in 56 malnourished patients was significantly greater than 117 well-nourished patients (6 vs 4 days p < 0.01). while in a study on a Brazilian old age patients discussing the relation between malnutrition and length of hospital stay; the mean age of patients was 50.67 +/- 17.3 years, and 50.2% of patients were males. Malnourished patients stayed in the hospital for 16.7 days vs 10.1 days in the nourished patients (Waitzberg et al., 2001). The same findings were reported by Isabel et al., (2003) and Kyle et al., 2005 from Switzerland. This is supported by a Brazilian study by Leandro-Merhi and Braga de Aquino, (2010), and they studied the Nutritional status and length of hospital stay for surgical patients. HLOS was more in males vs females (median 5 vs 3 days). Another study from Brazil by Leandro-Merhi, et al., published in 2011, the authors tried to find out the factors affecting the HLOS and they found that; the disease itself was the factor that influenced LOS the most in the studied population. Longer LOS prevailed in males (P < .0001), patients aged ≥60 years (P = .0008) and malnourished patients (P = .0034).

 In this study, MAC, TSF and MAMC were considered as good indicators of nutrition status (p value 0.000, 0.000, 0.003 respectively), this is supported by James et al., 1994, who variously sampled adults from selected regions of five African countries, India, China and Papua New Guinea were measured and proved that Mid-upper arm circumference (MUAC) was found to be a simple screening test of nutritional state. In combination with BMI it may be a better means of discriminating the at-risk underweight adults from those who are thin but not at risk. Also, Vlaming et al., 2001, assessed the nutrition of 1561 patients on emergency admission to hospital; they found that there was a close relationship between BMI and MUAC. BMI was poor predictor of hospital stay. MUAC is easier to measure and predicts poor outcome better.

 Summary

 In 1430 Hajj season, 163 Hajj patients from 34 countries were admitted at the medical department. The mean age was 59.4 ± 11 yrs., 52.1% were elderly patients (age ≥ 60 yrs.), and 57.7% of patients were males. Under-nutrition was found in 23.9% of patients, most of them (84.6%) were elderly. The nutrition status significantly affect the cause of admission, respiratory diseases were the commonest cause of admission (44.2%); it was more common in undernourished, and less in obese patients in the reverse to neurological disease. Mean hospital length of stay was 3.9±2.47 days; it was more prolonged in females (p 0.017) and in obese patients (p>0.05). Mid upper Arm Circumference is considered as a good indicator of nutrition status which is simple and easy especially in bedridden patients.

Conclusion

Nutritional assessment should be routinely performed at admission for hajj patients which may help the local health authorities in their future planes. ).

Some nationalities are more prone to develop some diseases as respiratory or neurological diseases; this may be explained by the nutritional status and need to be validated in larger studies.

 Mid upper Arm Circumference is considered as a good indicator of nutrition status which is simple and easy especially in bedridden patients.

Recommendation

To repeat this study on larger scale and in other hospitals during Hajj and Omrah.

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