

Pattern of medical diseases and determinants of prognosis of hospitalization during 2005 Muslim pilgrimage (Hajj) in a tertiary care hospital

A prospective cohort study

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ABSTRACT

Objectives: To document the pattern of medical diseases necessitating admission in a tertiary care hospital during Muslim pilgrimage (Hajj). To assess the risk factors associated with mortality during hospitalization.

Methods: The study was conducted at Al Noor Specialist Hospital, a 550-bed tertiary care teaching hospital, in Makkah, KSA. The participants included all Hajj patients admitted in the Department of Medicine in a 5-week period (January 3 to February 6, 2005) during the 2005 (1425 AH) Hajj. Information about demographics; past medical history; pre-Hajj functional status; presence of language barrier and translator availability; diagnosis for admission and complications during hospitalization including mortality was obtained prospectively using a standardized form.

Results: Six hundred and eighty-nine patients, belonging to 49 countries, with mean age of 62 years and male:female ratio of 1.8:1 were admitted. Two hundred-twenty (31.9%) had diabetes mellitus, 256 (37.2%) had hypertension, 219 (31.8%) had cardiac disease, and 103 (14.9%) patients had chronic lung disease. Of the 449 (65.2%) patients assessed, 284 (63.2%) patients had language barrier, and translator was not available for 152 (53.5%) of them. Pre-Hajj

functional status assessment of 240 patients showed that 20 (8.3%) required assistance in performing activities of daily living (ADL), and 40 (16.7%) could not walk for half kilometer without difficulty. Common causes of morbidity were: 235 (34.1%) cardiovascular, 137 (19.9%) infectious and 85 (12.3%) neurological diseases. One hundred and fourteen (16.5%) patients died, with the common causes being pneumonia (28 patients), acute coronary syndrome (21), and stroke (20). The risk factors associated with higher mortality were older age (65 ± 1 versus 61 ± 0.6 years, $p=0.008$), prior history of chronic lung disease (crude odds ratio, 1.81, $p=0.034$), dependence in any ADLs (4.90, $p=0.025$), inability to ambulate for half kilometer without difficulty (4.17, $p=0.017$) and non-availability of translator for patients with language barrier (5.51, $p<0.0001$).

Conclusions: Most patients were elderly with high prevalence of chronic medical disorders. Non-infectious diseases accounted for most morbidity and mortality. Pre-Hajj functional assessment should be carried out to identify patients at high risk of mortality. Provision of translator services for patients with language barrier is essential to improve future outcomes.

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The Muslim pilgrimage (Hajj) is one of the important rituals of Islam and considered obligatory for every Muslim at least once in a lifetime. Annually, more than 2 million pilgrims, belonging to more than 140 countries, perform Hajj.^{1,2} The rituals of Hajj are performed from 8th-13th of the last month of Islamic lunar calendar in the city of Makkah and the adjacent Al-Mashaer area (which includes Mina and Arafat) in the Kingdom of Saudi Arabia (KSA). However, the arrival of pilgrims starts several weeks prior to the days of Hajj and they continue to depart over several weeks after the performance of Hajj. As the Islamic lunar calendar are 11 days lesser than the Gregorian calendar, the exact dates and the season of Hajj vary from year to year.

Due to the requirements of the rites of Hajj, a huge number of pilgrims gather in a relatively small area for a short period of time that gives it a special health and epidemiological significance. The pattern of diseases seen depends partly on the weather condition of that particular year. Hajj of this year (1425 AH/2005 AD) fell in a season with milder temperatures. Providing healthcare services to the pilgrims is an enormous challenge. There are an extensive array of healthcare services organized by various authorities in KSA as well as the Hajj missions (pilgrim coordination centers) of different countries.

Most studies related to health problems among Hajj pilgrims have focused on heat related, and infectious diseases.³⁻⁹ There are no studies that have evaluated the pattern of medical diseases necessitating hospitalization of Hajj pilgrims in a tertiary care center. They represent most critically ill patients, or they need specialized diagnostic or therapeutic measures. There are no studies evaluating the risk factors that could affect the outcome of their hospitalization. The aim of our study was to document the prevalence of various medical diseases requiring admission in a tertiary care hospital, their outcome of hospitalization and to identify the risk factors associated with mortality during hospitalization.

Methods. The study was conducted at Al-Noor Specialist Hospital, a 550-bed tertiary care teaching hospital, in Makkah, KSA. It serves as the major referral hospital for the Hajj pilgrims. Patients present to the emergency department or one of the several outpatient clinics run for pilgrims during this time. The capacity of department of medicine is extended to 110 beds in general ward, 34 beds in coronary care unit (CCU), and 30 beds in intensive care unit (ICU) to meet the increased demands during this period.

The rituals of this Hajj were performed from the 18th-23rd of January 2005. The study was conducted

over a period of 35 days (January 3 to February 6, 2005) divided in 5 weekly intervals, with the Hajj falling in the 3rd week. All patients admitted to the Department of Medicine during this time period were included in the study

The study was approved by the Medical Research Committee of the hospital. A standardized questionnaire was used to collect information on demographics (name, age, gender, and nationality), and details of hospitalization (type of admission, admission and discharge dates, and outcome). Admission type was classified as primary (patients who came to hospital directly) or referral (referred from any healthcare facility outside the hospital). Language barrier was defined as communication difficulty due to lack of a common spoken language between patients (or their attendants) and their treating physician team. Availability of translator for patients with language barrier was recorded.

Pre-Hajj functional status (one month prior to arrival for Hajj) was assessed by ability to perform 3 activities of daily living (ADLs), namely, feeding, bathing, and toileting independently. Ambulatory status was assessed as independent, use of any assisting device (cane, walker, or wheelchair), or bedridden. Question regarding ability to walk for half a kilometer without any difficulty was asked. If patients could not understand this question, they were asked regarding ability to visit a market or a mosque near their home by walking. Hospitalization, from any cause, in the preceding 6 months was noted. Prevalence of past diagnosis of diabetes, hypertension, cardiac disease, and chronic lung disease were assessed either by patients giving their history or clinical evidence of them. For the current hospitalization, symptoms at the time of admission, primary (the disease responsible for the admission to our hospital) and secondary (the disease(s) that coexisted or developed during hospitalization) diagnosis were recorded. Development of hemodynamic instability (systolic blood pressure <90 mmHg), need for mechanical ventilation and admission in ICU during hospitalization, and outcome of hospitalization were recorded. Adverse outcome was defined as death during hospitalization. The study was planned as a prospective cohort study. However, due to excessive demands of patient care, we could not collect all the intended information while the patients were hospitalized. The missing information, if available, was recorded by reviewing their medical records. Chi-square test was used to find dependency between categorical variables and Mann-Whitney test was used to compare means of continuous variables. The Statistical Package for Social Sciences version 11.0 (Chicago, IL, USA) was used for the statistical analysis.

Table 1 - Age distribution of patients and mortality in different age groups.

Age (years)	Patients N (%)	Deaths N (%)*	Mortality rate (%)
<20	4 (0.6)	0 (0)	0
20-39	30 (4.4)	4 (3.5)	(13.3)
40-59	182 (26.4)	23 (20.2)	(12.6)
60-79	426 (61.8)	77 (67.5)	(18.1)
≥80	47 (6.8)	10 (8.8)	(21.3)
*Percentage of total deaths			

Table 2 - Frequency of admission and mortality during each week of the study.

Admission (week)	Patients N (%)	Deaths N (%)†	Mortality rate (%)
Week 1	97 (14.1)	13 (11.4)	(13.4)
Week 2	155 (22.5)	24 (21.1)	(15.5)
Week 3*	242 (35.1)	35 (30.7)	(14.5)
Week 4	133 (19.3)	21 (18.4)	(15.8)
Week 5	62 (9)	21 (18.4)	(33.9)
*The week of Hajj ritual performance †Percentage of total deaths			

Results. Of the 2,759 Hajj patients evaluated in the emergency department, 689 (25%) were admitted to the department of medicine. Of these 448 (65%) were referrals while 241 (35%) were primary admissions. The mean and median ages were 62 and 63 years (range, 11-112 years). Most patients were elderly (age >60 years) as shown in **Table 1**. Males constituted 452 (65.6%) of the patients. The frequency of admissions during each week of the study is shown in **Table 2**. Maximum admissions took place during the week of Hajj.

The patients belonged to 49 different nationalities. **Table 3** shows the geographic regions and the common countries of origin. They spoke 55 different languages as mother tongue. Of the 689 patients, 491 (71.3%) patients had language barrier as indicated in medical records by their treating physician teams. Of the 449 (65.2%) patients assessed for the need and availability of translator, 284 (63.2%) patients had language barrier and translator was not available for 152 (53.5%) of them.

Past history of diabetes mellitus was present in 220 (31.9%), hypertension in 256 (37.2%), cardiac

Table 3 - Geographic regions and major countries of origin of patients with distribution of mortality.

Region/Country	Patient N (%)	Mortality N (%)*	Mortality rate (%)†
Middle East	191 (27.7)	28 (24.6)	(14.7)
Turkey	110	22	(20)
Iran	21	3	(14.3)
Iraq	21	2	(9.5)
Others	39	1	(2.6)
South Asia	175 (25.4)	17 (14.9)	(9.7)
Pakistan	93	11	(11.8)
India	44	1	(2.3)
Bangladesh	21	4	(19)
Others	17	1	(5.9)
Southeast Asia	146 (21.2)	48 (42.1)	(32.9)
Indonesia	98	38	(38.8)
Malaysia	32	9	(28.1)
Others	16	1	(6.2)
Africa	114 (16.5)	15 (13.2)	(13.2)
Egypt	37	3	(8.1)
Nigeria	24	1	(4.2)
Algeria	17	5	(29.4)
Others	36	6	(16.7)
Asia, others	41 (6.0)	6 (5.3)	(14.6)
Europe	18 (2.6)	0	0
UK	12	0	0
Others	6	0	0
American continents	4 (0.6)	0	0
*Percentage of total mortality †Mortality rate by region/country			

Table 4 - Common symptoms and clinical presentations at the time of admission.

Symptom/presentation	Patients N (%)
Dyspnea	264 (38.3)
Chest pain	171 (24.8)
Cough	152 (22.1)
Fever	132 (19.2)
Hematemesis / Melena	80 (11.6)
Focal neurological deficit	60 (8.7)
Vomiting	44 (6.4)
Abdominal pain	41 (5.9)
Coma	39 (5.7)
Confusion	39 (5.7)
Altered sensorium	29 (4.2)
Dizziness	25 (3.6)
Palpitations	21 (3)
Sweating	15 (2.3)
Cardio respiratory arrest	14 (1.9)

Table 5 - Primary organ system and major diagnosis and mortality by primary diagnosis.*

Organ system/ diagnosis	Primary diagnosis	Secondary diagnosis	Mortality†
	N (%)	N (%)	N (%)
Cardiovascular disorders	235 (34.1)	139 (20.2)	31 (27.2)
Acute coronary syndrome	162	16	21
Heart Failure	36	52	5
Arrhythmia	30	41	5
Others	1	30	0
Infectious diseases	137 (19.9)	192 (27.9)	35 (30.7)
Pneumonia	102	77	28
Tuberculosis	6	23	0
Meningitis	5	1	0
Acute viral hepatitis	4	0	0
Others	20	91	6
Neurological disorders	85 (12.3)	18 (2.6)	20 (17.6)
Stroke	76	8	20
Others	9	10	0
Gastrointestinal disorders	76 (11)	25 (3.6)	10 (8.8)
Upper gastrointestinal bleeding	34	5	6
Chronic liver disease complications	32	7	2
Others	10	13	1
Respiratory tract diseases	63 (9.1)	59 (8.6)	9 (7.9)
Chronic obstructive airway disease	41	14	7
Asthma	18	24	1
Others	4	21	1
Endocrinologic/Metabolic disorders	29 (4.2)	38 (5.5)	5 (4.4)
Diabetes complications	27	16	5
Others	2	22	0 (0)
Renal diseases	28 (4.1)	68 (9.9)	0
Acute renal failure	16	49	0
Chronic renal failure complications	10	17	0
Others	2	2	3 (2.6)
Malignancy related complications	18 (2.6)	23 (3.3)	0 (0)
Hematological disorders	13 (1.9)	39 (5.7)	1 (0.9)
Others	5 (0.6)	53 (7.7)	

*Primary diagnosis is the disease which led to hospitalization; secondary diagnosis is the disease that co-existed on presentation or developed during hospitalization
†Mortality by the primary diagnosis

disease in 219 (31.8%), and chronic lung disease in 103 (14.9%) patients. Pre-Hajj functional status could be obtained for 240 (34.8%) patients. Twenty (8.3%) patients needed assistance in performing one or more of the 3 ADLs. Assisting device for ambulation was used by 23 (9.6%) patients. Five patients were bed ridden prior to coming for Hajj. Forty (16.7%) patients could not walk for half kilometer without difficulty. Hospitalization in the preceding 6 months was experienced by 59 of 206 (28.6%) patients from whom this information was obtained. Common symptoms or clinical presentations of these patients at the time of admission are shown in **Table 4**. Cardio respiratory symptoms were the most common, followed by neurological and gastrointestinal complaints. Thirty-nine (5.7%) patients were deeply comatose on arrival in hospital while 14 (2%) patients presented after

being resuscitated for cardio respiratory arrest outside the hospital.

The organ systems affected with the common primary and secondary diagnosis of these patients are shown in **Table 5**. Cardiovascular disorders accounted for nearly one third of primary diagnosis. Of 162 patients with acute coronary syndrome, 116 (71.6%) had myocardial infarction while 46 (28.4%) had unstable angina. The most common cardiac rhythm problem was atrial fibrillation in 12 patients while 8 had a complete heart block. Twelve patients had complications of rheumatic heart disease. Of 76 patients with stroke, information regarding the type of stroke was available for 71 patients. Ischemic event occurred in 45 (63.4%), parenchymal hemorrhage in 17 (23.9%), and transient ischemic attack in 6 patients. Two patients had subdural hematoma while one had

subarachnoid hemorrhage. Of the 55 patients with upper gastrointestinal bleeding, causes in 52 patients were identified. Peptic ulcer disease was present in 23 (44.2%) patients while 21 (40.3%) patients had varices. Esophageal ulceration and gastro-duodenitis was present in 2 patients each while esophagitis, Mallory-Weiss tear, esophageal candidiasis, and gastric telangiectasias were present in one patient each. Other complications of chronic liver disease were present in 11 patients (5 had encephalopathy, 4 had spontaneous bacterial peritonitis, and 2 had massive ascites). The most common pulmonary diagnosis was acute exacerbations of obstructive airway diseases. Six patients were diagnosed to have deep vein thrombosis; while 5 others were diagnosed to have pulmonary embolism. Diabetes related complications presented in 27 patients (14 had diabetic ketoacidosis, 8 had hyperosmolar state, and 5 had hypoglycemia). The most common infectious disease was pneumonia followed by tuberculosis. Six patients were diagnosed to have sepsis with unclear primary infection site. Five patients had clinical diagnosis of meningitis. Cerebrospinal fluid studies showed meningococcal and pneumococcal meningitis in one patient each; while 3 were diagnosed to have viral etiology. Food and water borne diseases such as gastroenteritis, hepatitis A, and food poisoning were relatively uncommon. Three patients had human immunodeficiency virus (HIV) infection related complications. Only one patient had malaria.

The mean and median for duration of hospitalization were 4 and 2 days (range, 1-81 days). One hundred sixty-one (23.4%) patients developed hemodynamic instability, and 158 (22.9%) required mechanical ventilation. One hundred and seventy-six (25.5%) patients needed admission to ICU. Outcome of the hospitalization was available for 688 patients. Four hundred and forty-four (64.5%) patients had improved at the time of discharge. Due to the need to make hospital beds available, 52 (7.5%) patients were transferred to other healthcare facilities. Seventy-eight (11.3%) patients left the hospital against medical advice. These patients were excluded from analysis of determinants of adverse outcome. A total of 114 (16.5%) patients died during hospitalization. The geographic regions and common countries of origin of patients who died are shown in **Table 3**. The organ systems and common primary diagnosis of patients who died are shown in **Table 5**. The highest case fatality rates were seen for primary diagnosis of pneumonia (36.4%) followed by stroke (26.3%), acute complications of diabetes (18.5%), and upper gastrointestinal bleeding (17.6%).

The mean age of patients who died was 65 ± 1 (mean \pm standard error of mean) versus 61 ± 0.6 years for those who improved ($p=0.008$). The mean duration of admission for those who died was 7.8 ± 1.2 versus 3.4 ± 0.2 for those who improved ($p=0.005$). There was no significant association between mortality and gender of patients (crude odds ratio, 1.29, 95% confidence interval 0.83-2.00, $p=0.25$) and the type of admission (1.44, 0.92-2.25, $p=0.11$). Past history of chronic lung disease was significantly associated with higher mortality (1.81, 1.02-3.06, $p=0.034$). However, past history of diabetes (1.38, 0.88-2.07, $p=0.17$), hypertension (0.75, 0.49-1.16, $p=0.20$), and cardiac disease (0.97, 0.63-1.49, $p=0.88$) did not lead to higher mortality.

The patients with language barrier had very significantly higher mortality (2.93, 1.68-5.31, $p<0.0001$). This higher mortality was attributable to non-availability of translator service. Among patients with language barrier, those who did not have the translator had very significantly higher mortality compared with those with available translator (5.51, 2.72-11.18, $p<0.0001$). There was no difference in mortality between patients having language barrier with a translator compared with those without language barrier (1.15, 0.49-2.71, $p=0.75$). Patients admitted after Hajj ritual performance had higher mortality (1.6, 1.1-2.4, $p=0.02$). This difference was due to larger number of patients with language barrier lacking a translator presenting after Hajj (5.65, 3.02-10.26, $p<0.0001$). Significantly, higher mortality was seen in patients needing assistance in one or more of ADLs (4.90, 1.38-17.39, $p=0.025$), and those with difficulty in walking for half a kilometer (4.17, 1.36-12.83, $p=0.017$). Use of an assisting device for ambulation (2.80, 0.71-11.04, $p=0.12$), and hospitalization in the preceding 6 months (3.47, 0.42-28.43, $p=0.29$) were not associated with higher mortality.

Discussion. Our study documents the pattern of medical diseases in Hajj pilgrims admitted in a tertiary care hospital. The age and gender distribution of patients were similar to previous studies in Hajj pilgrims.^{10,11} However, the past history of chronic medical conditions was much higher in our patients than previously reported.¹⁰ This may be due to different healthcare setting of the studies. This previous study was conducted in 4 secondary care, short-stay hospitals in Al Mashaer, operational during Hajj period with all patients presenting directly to them. While two thirds of our patients were referred from other healthcare facilities. Patients presenting directly to our hospital were screened in the triage

area of emergency department. Only patients with critical illness or requiring immediate assessment were registered in the emergency department. Others were referred to one of the several outpatient clinics of the hospital. This also explains the lack of difference in outcome of patients with primary and referral admission. Interestingly, we did not find increase in mortality during hospitalization among patients with past history of diabetes, hypertension and cardiac diseases. Only underlying chronic lung disease was associated with increased mortality.

As a group, infectious diseases have received most attention due to their epidemiological importance not only for the Hajj pilgrims, but also for the communities of their origin.¹² However, they accounted for approximately 20% morbidity and 28% mortality in our patients. The largest causes of morbidity and mortality were cardiovascular diseases and stroke. This may be expected in these elderly patients with high prevalence of cardiovascular risk factors. Screening of prospective pilgrim's >50 years old for cardiovascular risk factors and diseases and appropriate adjustments of their treatment have been shown to decrease hospitalization and mortality during Hajj.¹³ The rituals of Hajj are physically demanding and need walking for long distances (up to several kilometers) in overcrowded conditions. There is also disruption of usual daily routine and sleep-wake pattern. Prospective pilgrims should be made aware of the physical exertion involved in performing Hajj and encouraged to improve cardiovascular fitness prior to coming for Hajj. There was also significant proportion of patients with other chronic diseases such as renal failure, hepatic failure, chronic lung disease, and malignant diseases that caused complications leading to their hospitalization. Though we did not look specifically at treatment compliance after patient's arrival for Hajj, it was observed that in the process of completing Hajj as mandated, many patients were irregular in taking their prescribed treatment. This may be one of the contributing factors in causing complications of their underlying diseases. Education of prospective pilgrims regarding the nature of their underlying diseases and need for treatment compliance may be helpful in reducing such complications.

In summers, the most common cause of death used to be heat related illnesses and gastroenteritis.³⁻⁵ During 1985 Hajj, 615 deaths were reported due to heat stroke.³ As a result of measures such as education of pilgrims, establishment of heat stroke units, and special cooling beds, this decreased to 90 deaths in 1986.^{3,6} There were no heat related illnesses among our patients probably due to the milder weather during this Hajj. Pneumonia remains to be major cause of

morbidity and had highest case fatality rate. Similar observation has been reported previously.³ This may be due to old age and high prevalence of underlying chronic medical diseases. The close contact among pilgrims facilitates the spread of aerosolized and airborne infections. There is a high incidence of upper respiratory tract infections (URTI) during Hajj among pilgrims.⁹ They may facilitate the spread of airborne infections and contribute to acute exacerbation of obstructive airway diseases. In a study of pilgrims from Pakistan, use of influenza vaccine led to significant decrease in symptoms of URTI and medication uses.¹⁴ Twenty-nine patients were diagnosed with tuberculosis. Many pilgrims come from areas with high prevalence of tuberculosis. Tuberculosis has been reported as the most common cause of pneumonia among hospitalized Hajj pilgrims.⁸ However, we did not find the similar pattern in our study. Most patients with lower respiratory complaints were tested for tuberculosis. Education of the pilgrims regarding appropriate method of coughing and sputum disposal, use of face mask, and reducing the incidence of URTI by influenza vaccination may decrease the incidence of pneumonia and transmission of other airborne illness.^{9,15} However, these strategies need to be formally tested. Due to specific measures to improve food and water hygiene, particularly monitoring of eateries and restaurants taken by the various civil authorities, the incidence of diseases such as gastroenteritis, food poisoning, and viral hepatitis A have reduced significantly.¹⁵ There have been outbreaks of meningococcal meningitis among Hajj pilgrims and their contacts in the communities of their origin.^{7,16,17} With the institution of KSA Ministry of Health's strict regulation on mandatory vaccination of all pilgrims with quadrivalent meningococcal vaccine in 2001, the reports of meningococcal meningitis cases have dramatically declined.^{18,19} We had only one patient with proven meningococcal meningitis.

To provide care to patients from 49 countries speaking 55 languages in a short period of 5 weeks is a unique challenge. Nearly two-third of the patients had language barrier and for those who were assessed approximately half did not have any translator available. This was particularly true for pilgrims from Turkey and countries of South-East Asia, Central Asia, and non-Arabic speaking Africa. Most of the information for their current and past medical problems was obtained, when available, from review of referral papers from their respective Hajj missions. Absence of verbal communication impaired getting appropriate details of patient's health history as well as hindered the detection of new complications that patient might have developed during hospitalization.

As can be expected, there was very highly significant increase in mortality among patients for whom translators were not available. There was significantly higher proportion of patients with language barrier hospitalized in the last 2 weeks of the study. This may reflect their difficulty in accessing healthcare facilities leading to delay in seeking treatment.

We evaluated the functional status of 240 patients, as recalled by them, one month prior to coming for Hajj. This approach of self-reported retrospective functional status assessment has been validated.²⁰ A limitation in ADLs in elderly patients has been shown to be associated with higher mortality during hospitalization.²¹ We also found significantly higher mortality among patients who were dependent for any of the 3 ADLs that we assessed. Patients with limited functional capacity, as evidenced by inability to ambulate for short distance outside home, had higher mortality. This has been shown by other investigators.²²

In summary, most of the patients hospitalized in our center were elderly with high prevalence of chronic medical diseases. Education of the prospective Hajj pilgrims to get formal medical evaluation prior to coming for Hajj may be helpful in identifying, and getting appropriate treatment for their diseases. A formal medical report detailing their underlying medical problems will be helpful in assessing and providing healthcare, if needed, during Hajj. Future studies to identify measures to reduce cardiovascular and stroke morbidity, and mortality during Hajj are needed. There is a need to have better understanding of the reasons for high case fatality rates due to pneumonia during Hajj. Non-availability of translator for patients with language barrier was the single highest risk factor for mortality. Every effort should be made by local authorities in collaboration with Hajj missions of various countries to provide readily available translator services to the physician teams caring for such patients. Assessment of functional status and ambulatory capacity should be a routine part of clinical assessment to identify patients at high risk of mortality. Interventions that would reduce mortality for this group also need to be studied.

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