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Trend of diseases among Iranian pilgrims during five consecutive years based on a Syndromic Surveillance System in Hajj

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Abstract

Background: Every year more than 2 million people depart from Iran to Saudi Arabia for Hajj ritual which can be faced with some different diseases. There are not much information about frequencies and trend of diseases in Hajj. The main objective of this study was to determine the trend of prevalent diseases during five consecutive Hajj rituals among Iranian pilgrims.

Methods: We established a specific surveillance system for all Iranian pilgrims who had participated in Hajj from 2004 to 2008. We monitored the pilgrims' health status before departure, through their journey. The understudied diseases were 19 selected types of diseases in the Hajj. The occurrences of diseases were recorded on a researchers-made questionnaire. We used chi-square test for analysis with the alpha lower than 5% to reject the null hypothesis.

Results: During 5 consecutive periods, a total of 254,823 of Iranian pilgrims were monitored for more common diseases with this system. The most prevalent diseases were as follows: at least one type of respiratory involvement (71.26%), common cold like syndrome (47.15%), and musculoskeletal disorders (18.67%), The frequency of respiratory involvement was lower in 2006 than other years ($p < 0.001$).There were statistically significant differences between the numbers of hospitalization and patients who were referred back to Iran with the year of Hajj ($p < 0.001$).

Conclusion: Health managers should be informed about trend and frequency of more prevalent diseases in Hajj. Easy access to health information via such surveillance system can be possible.

Keywords: Disease, prevalence, respiratory disorders, Iran, Saudi Arabia

Introduction

Hajj is the largest annual religious ritual in the world, and also an obligation to be carried out at least once in the lifetime of every physically, psychologically and financially able Muslim. Every year more than 2 million people travel from Iran to

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Saudi Arabia for accomplishing the ritual (1,2). There are many variables that predispose pilgrims to become ill. Some of these factors are: overcrowding, stresses, dietary changes, sleep habits, over-enthusiastic exertions and strenuous physical efforts (2). Therefore, the pilgrims can be faced with various diseases such as respiratory diseases with prolonged coughs (3,4), exacerbation of their previous diseases like bronchial asthma, chronic obstructive pulmonary diseases (COPD) (5), diabetes mellitus, hypertension, cardiac diseases, neurological diseases and getting new diseases including stroke (6), gastroenteritis and food poisoning, hepatitis A, B &C, various zoonotic diseases (7,8), behavioral, mood and sleep disorders (9), and various degree of injuries during Hajj period (10).

However, in this study, we aimed to determine the frequencies and the trend of the most common diseases using a specific surveillance system during five consecutive years in Hajj. The results of this study can help health providers to plan for better years.

Methods

Study population: The pilgrims constituted 530,000 people (more than 100,000 ones every year) divided in 2500 large groups called caravans (at least 450 caravans every

Table 1. Operational definitions of under surveillance diseases:

Hypertension: A repeatedly elevated systolic blood pressure equal or above 140 mm/Hg with a diastolic pressure above 90 mm/Hg (12).

Heart disease: Any changes that affects the heart's ability to function normally on the basis of diagnosis don by the assigned physician.

Musculoskeletal Diseases: Complain of the pain on the muscles, bones and their associated ligaments and other connective tissues (12).

Gastritis: A repeatedly burning pain in the upper abdomen that is worse with the empty stomach. Other symptoms include nausea, vomiting, loss of appetite, and weight loss (12,13).

Sunburn: reddening, inflammation, and, in severe cases, blistering and peeling of the skin caused by overexposure to the ultraviolet rays of the sun (14).

Noninvasive gastroenteritis: include nausea and vomiting, watery diarrhea for 3 times a day, and mild abdominal cramps with normal stool tests (12,15).

Invasive gastroenteritis: This form accompanied by fever , weakness, myalgia, severe abdominal cramps and bloody diarrhea with presence of inflammatory cells, bloody mucus or positive stool culture (12,15).

Conjunctivitis: Redness and purulent conjunctiva with any causes.

Psychological disorders: Reappearance of any former diagnosed psychological disorders by a psychiatrist or: Acute impairment of normal cognitive, emotional, or behavioral functioning (16).

Dementia: Impairment of memory, judgment, attention span, and problem solving skills of an old man/woman on the basis of physicians' diagnosis (16).

Stroke: History of approved cerebrovascular accident or: a sudden loss of muscular control, diminution or loss of sensation or consciousness, dizziness, slurred speech, or other symptoms diagnosed by physician (17).

Common cold: Upper respiratory symptoms with low grade fever, runny nose, sneezing, nasal congestion, headache, muscle ache, sore throat, hoarseness, watery eyes, tiredness, and dry cough with a good condition (18).

Influenza Like Illness: Symptoms & signs such as: sudden headache, dry cough, high grade fever, myalgia, coryza, malaise and loss of appetite with a abnormal general appearance (12,19).

Sinusitis: Tenderness of the face, pain on the forehead, cheeks or behind the eyes, post nasal drip, and possibly a stuffy nose, pain in the upper teeth, a headache in the morning or when the patient lean over and fever .This problem should be confirmed by radiography (17).(CT-Scan is not a routinely available in Hajj)

Pneumonia: Acute inflammation of the lower respiratory tract that confirmed by chest radiography.

Allergic Rhinitis: A repeated seasonal inflammation of the nasal passages usually associated with watery nasal discharge, itching of the nose and eyes and sneezing (20).

Asthma: Recurrent attacks of breathlessness and wheezing, which vary in severity and frequency from person to person (21).

Exudative Pharyngitis: Is manifested by: fever >38 degrees centigrade– difficulty in saliva swallowing – chills – painful lymphadenopathy in the anterior of the neck and presence of turbid or yellow exudates on the tonsils.

year).They participated in Hajj rituals in 5 consecutive years from 2004 through 2008. The physicians were consisted of 2500 personnel (general practitioners or specialists) who served pilgrims in the caravans. The pilgrims attended in Hajj ritual for about 30 days in every year. We monitored a total of 254,823 out of 530,000 pilgrims in 1352 Caravans for common diseases in our surveillance system.

Stages of labor: Establishing the syndromic surveillance system (SSS): At the first stage, we established a SSS which used for early detection of outbreaks, to follow the size, spread, and duration of outbreaks, in order to monitor disease trends, and provide reassurance that the outbreak would not occurred" in future gathering (11).

Prior to their departure to Saudi Arabia, all Iranian pilgrims were clinically and para-clinically examined on the basis of a unique protocol which notified by Medical Board of Islamic Republic of Iran's Red Crescent for Hajj as a legal and ethical (10). Influenza and Pneumococcal vaccines were prescribed for all pilgrims 15 days before their departure.

Health profiles were made for pilgrims and screened for cardiac diseases, hypertension, respiratory diseases, diabetes mellitus and psychiatric disorders by their physicians before the journey. All the physicians were trained for the research process.

During the journey, when the pilgrims felt sick, they were be firstly visited by their physician in the caravan. If the patients needed more care, the physician referred them to the Islamic Republic of Iran hospitals in Mecca and Medina (one hospital for each city). In this system, the carevan's physicians could do the necessary laboratory tests via the hospital.

At the end of the journey, the changes in health status of the pilgrims were reported to the surveillance system by physicians.

Under studied diseases/ syndromes: During the 5 consecutive Hajj periods, frequency and distribution of common diseases were kept under surveillance to identify the trends of diseases. The understudied diseases/ syndromes were included 19 selected types of respiratory, cardiovascular, gastrointestinal and other common diseases in Hajj based on previous studies. The operational definitions of under surveillance diseases are presented in table 1 (12-21).

Table 2. The distributions of understudied populations in each year and their caravans

Year	2004	2005	2006	2007	2008	Total
Number of reported pilgrims	30037	75676	48678	71595	28837	254,823
Number of reported caravans	166	375	290	370	151	1352

Table 3. Frequency of common reported respiratory diseases among Iranian pilgrims in Hajj.

Disease	2004 N = 30037		2005 N= 75676		2006 N= 48678		2007 N=71595		2008 N=28837		Mean Percentage	p
	N	%	N	%	N	%	N	%	N	%		
CCLS 1	*	*	38468	50.83	18695	38.40	38366	53.58	13215	45.82	47.15	<0.001
ILL 2	*	*	14836	19.60	3774	7.75	7119	10.45	1420		10.68	<0.001
Sinusitis & Sinobronchitis	2001	6.66	7269	9.60	5086	10.45	9953	13.90	2181	9.66	10.05	<0.001
Pneumonia	73	0.24	255	0.34	391	0.80	283	0.39	126	0.51	0.45	<0.001
RAS 3	*	*	23717	31.34	5909	12.13	10828	15.12	2296	10.82	17.35	<0.001
Asthma & COPD	471	1.57	1123	1.48	1044	2.14	1792	2.53	546	1.89	1.92	<0.001
Exudative Pharyngitis	2919	9.71	5965	7.88	3942	8.09	6459	9.04	1181	4.09	7.76	<0.001

1 – Common Cold Like Syndrome (CCLS), 2 – Influenza Like Illness (ILL), 3 – Respiratory Allergy Syndrome (RAS),
*Data were not available

Instrument: The physicians monitored and recorded any occurrence of the diseases among the pilgrims on a researchers-made questionnaire. Validity of the questionnaire was confirmed by some experts and its reliability verified in another study one year before starting the main project (2). Physicians of each caravan trained for the method of filling the questionnaire before their journey. The completed forms were checked by health surveillance supervisors.

Statistical analysis and ethical issues: We considered the dichotomous nominal variables for all of our analyses based on having a condition. Chi-square test was used for analytical purposes. Alpha was considered lower than 5% to reject the null hypothesis. The filled questionnaires were anonymous and had no ethical restrictions.

Results

A total of 254,823 Iranian pilgrims were monitored in 1352 caravans during five consecutive years for 19 types of common diseases in this system. The mean age of under studied pilgrims was 51 years, ranged from 15 to 95 years old, and sex distribution of 51% male and 49% female. The number of understudied population in each year and the number of their caravans are shown in Table 2.

According to physician's reports, about 181, 589 of pilgrims (71.26%) suffered from at least one type of respiratory symptoms. The frequency of respiratory involvement was lower in the year 2004 than the other years ($p<0.001$).The frequencies of 19 types of reported diseases / syndromes among Iranian pilgrims are presented in Table 3 and 4.

The most prevalent diseases were as follows: common cold like syndrome (47.15%), musculoskeletal disorders (18.67%), respiratory allergy syndrome (17.35%), hypertension (12%), influenza like illness (10.68%), and sinusitis & sinobronchitis (10.05%). There were statistically significant differences between frequency of each type of diseases and the year of Hajj (all of $p<0.05$). We observed 3 restricted gastroenteritis outbreaks during the five periods of Hajj.

Table 5 shows the frequencies of hospitalized, deported patients to Iran due to severity of their diseases, and deaths among Iranian pilgrims from 2006 through 2008. The percentages of hospitalization in these years were 1.3%, 1.43% and 1.6%, respectively. There was a statistically significant difference between the number of hospitalization and the year of Hajj ($p<0.001$). The frequencies of deported patients per 100,000 people were 34, 87 and 81, respectively, during the understudied years. There

Table 4. Frequency of common reported diseases among Iranian pilgrims in Hajj

Disease	2004 N = 30037		2005 N= 75676		2006 N= 48678		2007 N=71595		2008 N=28837		Mean Percentage	p value
	N	%	N	%	N	%	N	%	N	%		
Cardiac diseases	866	2.88	1075	1.42	1829	3.75	5100	7.12	643	2.23	3.7	<0.001
Hypertension	2519	8.39	5950	7.86	6139	12.6	11321	15.81	4469	15.5	12	<0.001
Stroke(old & new)	*	*	29	0.04	97	0.19	123	0.17	*	*	0.13	<0.001
Non-invasive Gastroenteritis	758	2.52	2000	2.64	1256	2.58	2050	2.86	630	2.18	2.5	<0.001
Invasive gastroenteritis	54	0.18	86	0.11	162	0.33	50	0.06	78	0.27	0.17	<0.001
Gastritis	1560	5.19	3940	5.20	2447	5.02	4224	5.89	1623	5.62	5.38	<0.001
Psychiatric disorders	*	*	402	0.53	630	1.29	911	1.27	269	0.93	0.99	<0.001
Dementia	59	0.2	113	0.15	62	0.13	138	0.19	66	0.23	0.17	0.003
Diabetes mellitus	733	2.44	2210	2.92	2652	5.44	5478	7.65	2398	8.31	5.35	<0.001
Musculoskeletal dis.	*	*	13478	17.81	7292	15	15815	22	5739	19.90	18.67	<0.001
Sun burn	*	*	3458	4.57	4467	9.17	1097	1.52	236	0.81	4.01	<0.001
Conjunctivitis	*	*	*	*	1944	3.99	201	0.27	718	2.48	2	<0.001

*Data were not available

Table 5. The frequencies of hospitalized, deported, and deaths among Iranian pilgrims during the Hajj from 2006 through 2008

Subject	2006	2007	2008	p value
Number (%) of hospitalized pilgrims	1356 (1.3%)	1435 (1.43)	16576 (1.6%)	<0.001
Deported pilgrims to Iran due to severity of their diseases per 100,000 people	34	87	81	<0.001
Deaths per 100,000 people	49	42	36	0.368

was a statistically significant difference between the number of patients who referred back to Iran and the year of Hajj ($p<0.001$). However, we did not find any relationship between the number of deaths and the year of Hajj ($p=0.368$).

Discussion

Using a syndromic surveillance system, we monitored near half of Iranian pilgrims who had participated in the five consecutive Hajj periods. We presented the trend and frequency of prevalent diseases during Hajj which could be helpful for health care mangers in this ceremony. The most common cause of morbidity among Iranian pilgrims was respiratory involvement so that, 71.26% of the pilgrims suffered from at least one type of respiratory diseases. Among all sorts of the respiratory diseases, common cold like syndrome with the rate of 47.15% was the most common one. This means that a high volume of researches and educations should be devoted to respiratory problems before and during the trip.

The reported frequencies of respiratory involvement in the year 2006 were significantly lower than the other years ($p<0.001$). We used influenza and pneumococcal vaccines in a high rate in this year in Hajj (2), and this significant difference may be related to these vaccines.

The most common reported cause of mortality among Iranian Hajj pilgrims during 10 years was cardiac diseases and the increasing in death rate, related to the increased cardiac diseases frequencies (22). In our study, the frequency of cardiac diseases in 2007 was 7.12%, and the death rate was 42/100,000. The frequency of cardiac diseases in 2008 was 2.23% after a better screening program before the journey and death rate was 36/100000. These results are compatible with aforementioned report. Therefore, screening on heart diseases should be emphasized before the journey.

Hypertension showed an ascending trend during the journeys. Hypertension is very common in the general population with a prevalence of 10 to 20 percent (23). In our study, the mean of hypertensive patients was about 12 percent, which was relatively compatible with the aforementioned study.

The prevalence of diabetes mellitus has increased in most populations throughout the world, and as well as in Iran (24,25). In present study, the reported frequencies of diabetes mellitus among Iranian pilgrims were 2.44% in 2004, 2.92% in 2005, 5.44% in 2006, 7.65 % in 2007, and 8.31% in the year 2008 with the total mean of 6.86%. The trend of diabetes was ascendant which was compatible with the findings of Iranian studies. A study conducted on a total of 3,778 men and women aged between 15 and 64 years in Khorasan province (north east of Iran) indicated a prevalence of 5.05% for diabetes mellitus (25), which was compatible with the total mean of 5.35% obtained in our study. International Diabetes Federation (IDF) estimated prevalence of diabetes mellitus among adult population in 223 countries in 2010. In this report, the lowest prevalence was in Rwanda by 1.1% and the highest one in Nauru by 31%.The prevalence of diabetes in Iran was reported 6.1% (26).

According to the report of AL- Mazrou in 2004, there was a continuous increase of food poisoning in Hajj ceremony (7). In our study, the frequencies of noninvasive and invasive gastroenteritis were in a perma-

nent trend and not increasing and this finding is probably related to improvement of water, food, and individual health behaviors.

In one study about Hajj diseases, psychiatric disorders were found in 92 patients. Additionally, behavior, mood and sleep disturbances were affected more commonly (65%, 63% and 59% respectively), and physical symptoms were reported in 28% of the patients (2). In Masood et al study about psychiatric morbidities in Hajj, the highest percentage (34%) was for neurosis, stress-related and somatoform disorders followed by mood disorders (22%) (8).The mean percentage of psychiatric disorders in our study was about 1% and we did not addressed the specific types of mental disorders in our study.

Suggestions

1) Health managers in other countries can copy and implement such surveillance system for their pilgrims in Hajj.

2) Health managers are able to adjust the medical needs according to the frequencies of diseases.

3) The Iranian physicians of caravans should stress on the screening program before every journey especially for cardiovascular diseases.

4) The physicians of caravans should train the pilgrims before and during the journeys.

5) Considering of participating of many old pilgrims and other high risk groups in Hajj, Influenza & Pneumococcal vaccines may be useful administering before every journey.

Conclusion

Health managers should be informed about trend and frequency of more prevalent diseases in Hajj. Easy access to health information via such surveillance system can be possible.

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References

1. Razavi SM, Dabiran S, Ziaee H.The incidence of influenza like illness and determination of the efficacy of Flu vaccine in Iranian pilgrims during Hajj pilgrim age. Acta Med Iranica. 2004; 42(6): 397-401.

2. Meysamie A, Ziaee-Ardakani H, Razavi SM, Doroodi T. Comparison of mortality and morbidity rates among Iranian pilgrims in Hajj 2004 and 2005. Saudi Arabia J. 2006; 27(7): 447-51.

3. Wilder-Smith A, Earnest A, Ravinran S, Paton NI. High incidence of pertusis among Hajj Pilgrims. Clin Inf dis. 2003; 37(9):1270-2.

4. Razavi M, Sadeghi-Hassanabadi M, Salamati P. The Comparison of Influenza Vaccine Efficacy on Respiratory Diseases among Iranian Pilgrims in the 2003 and 2004 Haj Seasons. Acta Med Iranica.2005; 43(4): 279-281.

5. Al-Ghandi SM, Akbar HO, Qari YA, Fathaldin OA, AL- Rashed RS.Pattern of admission to hospitals during Muslim pilgrimage (Hajj). Saudi Med J. 2003; 24:1073-6.

6. Khan NA, Ishag AM, Ahmad MS, El-Sayed FM, Bachal ZA, Abbas TG.Pattern of medical diseases and determinants of prognosis of hospitalization during 2005 Muslim pilgrimage Hajj in a tertiary care hospital.A prospective cohort study. Saudi Med J. 2006; 27(9):1373-80.

7. Memish ZA, venkatesh S, Ahmed QA. Travel Epidemiology: The Saudi perspective. Int J Antimicr Agents. 2003; 2: 96-101.

8. Al-Mazrou YY.Food poisoning in Saudi Arabia, potential for prevention.Saudi Med J. 2004; 25:11-14.

9. Masood K, Gazzazz J, Ismail K, Dhafark O, kamal A. Pattern of psychiatry morbidity during Hajj at Al-Noor Specialist Hospital. Int J Psychiatry Med. 2007; 37(2):163-72.

10. Razavi SM, Ziaee Ardakani H, Rajai S, Hollisaz MT Sadeghipoor, HR, Farshad AA, et al. Trends in Prevalent Injuries among Iranian Pilgrims in Hajj.Iranian J Pub Health. 2011; 40(2):110-15.

11. Kelly J. Henning. Overview of Syndromic Suveillance . What is Syndromic Suveillance?CDC, MMWR. Sept. 2004, 53 (supp.); 5 – 11.

12. Longo D, Fauci A, Kasper D, Hauser S, Jameson J,Loscalzo J.Harrison's principles of internal medicine.18th edition. NewYork. McGrawHill.

2011.

13. Kinoshita Y, Chiba T. Therapeutic effects of famotidine on chronic symptomatic gastritis: subgroup analysis from FUTURE study. J Gastroenterol. 2011; DOI 10.1007/s00535-011-0503-x.

14. Oxford Dictionaries. Definition of sunburn. Available from: http:// oxforddictionaries.com/ definition/english/sunburn

15. Powell CV, Priestley SJ, Young S, Heine RG. Randomized clinical trial of rapid versus 24-hour rehydration for children with acute gastroenteritis. Pediatrics. 2011; 128(4):771-8.

16. Bancher C, Jellinger KA. Neurofibrillary tangle predominant form of senile dementia of Alzheimer type: a rare subtype in very old subjects. Acta Neuropathol. 1994; 88(6):565-70.

17. Merriam-Webster's Medical Dictionary, © 2007 .Stroke. Available from: http://www. thefreedictionary.com/stroke

18. Caimmi D, Caimmi S, Labò E, Marseglia A, Pagella F, Castellazzi AM, et al. Acute isolated sphenoid sinusitis in children. Am J Rhinol Allergy. 2011; 25(6):200-2.

19. Chebbo A, Tfaili A, Jones SF. Hypoventilation syndromes. Med Clin North Am. 2011; 95(6):1189-202.

20. Miraglia Del Giudice M, Marseglia A, Leonardi S, La Rosa M, Salpietro C, Brunese FP, et al. Allergic rhinitis and quality of life in children. Int J Immunopathol Pharmacol. . 2011; 24(4):25-8.

21. World Health Organization. Chronic respiratorydisease. Asthma: definition. 2010. Available from: http://www.who.int/respiratory/asthma/definition/en

22. Annual report of the medical board of Islamic Republic of Iran's Red Crescent in Hajj 2005. Available from: http:// www.hmc.ir/Persian/ content/view/4/6/.

23. Saha I, Paul B, Mukherjee A, Biswas R, Dasgupta A. Validity of the WHO criteria for adolescent hypertension.East Afr J Public Health. 2011; 8(2): 135-7.

24. Larijani B, Zahedi F, Aghakhani S. Epidemology of diabetes mellitus in Iran. Shiraz Med J. 2003; 4(4); 1.

25. Aziminezhad M, Ghayaur- Mobarhan M, Parizadeh MR, Saffarian M, Esmaeili H, Parizadeh SM, et al. Prevalence of type 2 diabetes mellitus in Iran and its relationship with gender, urbanization, education, marital status and occupation. Singapore Med J. 2008; 49 (7):571.

26. International Diabetes Federation. Diabetes Prevalence-Country Rankings 2010. Available from: http://www.allcountries.org/ranks/diabetes_prevalence_country_ranks.html.html.