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Original Article

Trends in Prevalent Injuries among Iranian Pilgrims in Hajj

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Abstract

Background: Annually millions of Muslims depart to Saudi Arabia for performing a religious pilgrimage called "Hajj". In this ceremony, pilgrims face numerous health hazards and injuries such as pressing in overcrowding, sliding, burning, falling down, traffic accidents etc. The main purpose of this study was to determine the prevalence of injuries in Hajj period across 2004 to 2008.

Methods: This study was conducted on 253808 Iranian pilgrims on five consecutive years of Hajj ceremonies, from 2004 to 2008. We used a report sheet with 13 types of injuries and 13 mechanisms of these injuries. SPSS V13.5 soft ware was used for analyzing the data. ANOVA and independent sample *t* – test was conducted, and relationships were considered significant at $P< 0.05$.

Results: The most common injuries was "tissue contusions and ruptures "(about 76/10000), and "tendon lesions" (about 62/10000). In addition, the most common mechanism of injuries was "ankle sprain" (69/10000) during the five consecutive years. The prevalence of all fractures was about 49/10000 and the proportion of burning with hot water or fire was about 40/10000. Changes of all causes of the injuries were significant in this study ($P< 0.05$).

Conclusions: We have suggested some directions for preventing of injuries and related Injuries in Hajj, in this study.

Key words: *Hajj, Injuries, Bone Fractures, Trauma, Mechanisms of injuries*

Introduction

Hajj, the journey to the Holy mosque in Mecca, is once in a lifetime obligation for all Muslims who are healthy physically and financially. Every year, more than 2 million people from 140 countries around the world, including approximately 100000 Iranian, take part in the Hajj ceremony in Saudi Arabia (1, 2). This pilgrimage consists of two parts, the first one called Umrah-ul-Tamatoo and consists of five obligatory directions: 1) Ihram that must be worn at one of the Meeqaats. 2) Tawaf round the Kaaba. 3) Prayers (Salat after the tawaf). 4) Saee between Safa and Marwah. 5) Taqseer.

The Hajj-ul-Tamatoo applies to the second part but it is obligatory to perform the Umrah before the Hajj. Hajj- ul -Tamatoo consists of: 1) Wearing Ihram for Hajj and then observance the prohibited activities. 2) Staying at Arafat desert. 3) Staying at Muzdalifa desert. 4) Entrance to Mina desert. 5) Stoning the symbolic devil (Ramy) at Jamarat-Ul-Oqba. 6) Sacrifice (slaughtering an animal). 7) Staying in Mina. 8) Tawaf, Pryers, Saee of Hajj and Tawaf–Ul-Nisa. 9) Stoning at jamarat again (3).

Pilgrims encounter numerous health hazards and accidents in this festival (4). These hazards are likely because of some mechanisms such as overcrowd-

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ing, sliding, falling down, ankle twisting etc. Usually overcrowding occurs during Tawaf, Saee, and Ramy e' Jamarat, Sliding in Holly Haram, and falling down in Arafat (from *Jabal-ul-Rahmah* mountain or hotel stairs). Fire, traffic accidents as well as disasters (like flood) may be placed among the causes of injuries (2, 5).

During hajj, truma is one of the most important issues, should be taken into consideration (6). Some accidents like ankle sprains, soft tissue trauma like eye trauma, and hand trauma due to slaughtering also are reported during Hajj (5, 7). In a study, 3247 deaths due to disasters during Hajj have been reported from 1987 to 2006 (8).

The main purpose of this study was to determine the trend of injuries and their causal mechanisms in Hajj period from 2004 to 2008.

Materials and Methods

This study was conducted on 253808 Iranian pilgrims on five consecutive years of Hajj ceremonies, in Saudi Arabia from 2004 to 2008. Before of departure to Saudi Arabia, all of the pilgrims were clinically examined and their health status has been recorded in her/his file, and there were recorded all the types of injuries during the journey. At the end of every journey (along 5 yr), the abundance, and distribution of common injuries were recorded in the registration surveillance system. All of the pilgrims were enrolled into the study and every of them that had an acute and new type of injuries were excluded from the study.

In this study, a total of 1360 large groups (Karevans) were monitored at least for one month every year. In all groups, there was a physician (a GP or a specialist), who traveled with the pilgrims during the journeys. The physicians monitored the pilgrim's health status and recorded any incidence of the injuries on a report sheet, specially designed for the purpose. The report sheets contained 13 types of common injuries during Hajj and 13 suggested causes (mechanisms of injuries). For all of the injuries and their causes, there were some exact operational definition and clear ways for confirmation of them.

Selected injuries and the ways of their confirmation were shown in Table 1, and the list of considered causes including: Pressing in population density (overcrowding)- sliding in the bath-sliding on the ways- falling down from heights- falling down from electrical stairs (escalator)-sudden drop of elevator- traumatized during stoning of the symbolic devil-burning in the bath-burning with boiled water or hot tea- burned with fire-electrical injuries-take a heavy load -and twisted foot (ankle sprain).

All of the responsible physicians were trained for the method and quality of filling out the report sheets before and during the journeys.

Validity of the record sheets were confirmed by some expert physicians such as related specialists and health managers, and reliability of them were verified by performing a pilot study one year before starting the main study during Hajj 2003. At the end of each journey, the completed forms were delivered to surveillance system supervisors.

In this study, we used Spss V13.5 soft ware for data analysis. ANOVA, and independent sample *t*- test were conducted as well. Relationships were considered significant at $P< 0.05$.

There was no any limitation except the change of the Karevan's physicians in every year, and all ethical points were considered during the study.

Table 1: Suggested ways of confirmed diagnosis of the different injuries

Types of injuries	Ways of confirmation
Rib fractures	Plain radiography +orthopedist visit
Hand or foot fractures	Plain radiography +orthopedist visit
Long bones fractures	Plain radiography +orthopedist visit
Hip fractures	Plain radiography +orthopedist visit
Skull fractures	+ orthopedist visit
Spine fractures	Plain radiography +orthopedist visit
Multiple trauma & Fractures	Visit of related specialists
All fractures (In every shapes & Types)	Plain radiography +orthopedist visit
Tendon lesions	Plain radiography +orthopedist visit
Tissue contusions & ruptures of extremities	Karevan's physician diagnosis
Eyes Trauma	Ophthalmologist visit
Burning with hot water or fire (every Grades)	Karevan's physician diagnosis
Abortion	Gynecologist visit

Results

The reports were collected from 1360 large groups (Karevans), described the status of 13 types and 13 mechanisms of injuries among 253,808 Iranian pilgrims during Hajj 2004 to 2008. The frequencies of the causes that lead to injuries, were high in the year of 2006, and the most frequent Injury was "Ankle sprain".

Pilgrims whom were traumatized during stoning of the symbolic devil, in the year of 2004 were significantly more than the other years. Table 2 shows frequencies of the causes (mechanisms) of injuries in Hajj during the study.

The prevalence of the injuries demonstrated statistically significant differences in the different years as follows: Pressing in the population density P= 0.008, Sliding in the bath P= 0.008, Sliding on the ways P= 0.004, Falling dawn from heights P= 0.003, Falling dawn from escalator P= 0.001, Sudden drop of elevator P= 0.017, Traumatized during stoning of the symbolic devil P= 0.001, Burning in bath P= 0.033, Burning with hot water or tea P= 0.001, Trauma due to take a heavy load P= 0.008, and twisted foot P= 0.001.

Table 3 shows the frequencies of the "Types of injuries" during Hajj in two consecutive years from 2006 and 2007.

Table 2: Frequencies of the causes (mechanisms) of injuries in Hajj during 5 consecutive years from 2004 to 2008

Mechanisms of Injuries	2004 n=30037		2005 n=75676		2006 n=47663		2007 n=71595		2008 n=28837		Total / Mean n=253808	
	n	Per 10000	n	Per 10000	n	Per 10000	n	Per 10000	n	Per 10000	n	Per 10000
Pressing in population density (overcrowding)	*	*	*	*	*	*	1075	142	238	82	1313	13
Sliding in the bath and on the ways	104	35	239	32	269	56	306	42	87	30	1000	39
Falling down from heights	17	6	47	6	76	15	81	10	30	10	251	9
Falling down from electrical stairs (escalator)	22	7	76	10	103	21	71	4	28	9.5	300	11
Sudden drop of elevator	*	*	*	*	*	*	19	2	.	.	19	1
Traumatized during stoning of the symbolic devil	375	125	164	22	146	30	210	27	88	30	983	38
Burning in bath , with boiled water or hot tea or fire	138	46	38	51	374	78	339	47	31	10	1070	42
Electrical injuries	*	*	*	*	*	*	4	0.52	.	.	4	0.3
Take a heavy load	*	*	*	*	*	*	289	38	91	31	380	37
Twisted foot (ankle sprain)	183	61	531	70	481	100	412	54	159	55	1766	69

Table 3: The frequencies of the "Types of injuries" during Hajj in 2 consecutive years from2006to 2007

Types of Injuries	2006		2007		Average	
	n=71595	Per 10000	n=28837	Per 10000	n=100432	Per 10000
Rib fractures	95	13.26	29	10.05	124	11.65
Hand or foot fractures	۱۶۴	۲۲.۹	۴۶	۱۵.۹۵	۲۱۰	۱۹.۴۲
Long bones fractures	۲۳	۳.۲	۵	۱.۷۳	۲۸	۲.۴۶
Hip fractures	۱۰	۱.۴	۲	۰.۶۹	۱۲	۱.۰۴
Skull fractures	۷	۰.۹۷	۲	۰.۶۹	۹	۰.۸۳
Spine fractures	۴	۰.۵۵	۱	۰.۳۴	۵	۰.۴۴
Multiple trauma & Fractures	۲۳	۳.۲	۴	۱.۳۸	۲۷	۲.۲۹
All fractures (In every shapes & Types)	۳۲۶	۴۵.۵	۱۵۱	۵۲.۳۶	۴۷۷	۴۸.۹۳
Tendon lesions	۴۱۱	۵۷.۴	۱۹۰	۶۵.۸۸	۶۰۱	۶۱.۶۴
Tissue contusions & ruptures	۶۲۵	۸۷.۳	۱۸۷	۶۴.۸۴	۸۱۲	۷۶.۰۷
Eyes Trauma	۷۶	۱۰.۶	۳۰	۱۰.۴	۱۰۶	۱۰.۵
Burning with hot water or fire (every Grades)	۲۹۶	۴۱.۳۴	۱۰۸	۳۷.۴۵	۴۰۴	۳۹.۳۹
Abortion	۳	۰.۴	۰	۰	۳	۰.۲

Discussion

In this study, we have determined the prevalence of injuries in Hajj period from 2004 to 2008 among 253808 Iranian pilgrims. There are limited studies about trauma during Hajj in literatures, therefore we were obliged to use some related studies to trauma out of the Hajj conditions.

To perform the rituals over a short period in a small area (Holy places) and mass movement of pilgrims from one place to other place, overcrowding is an unavoidable phenomena which this important factor increase the risks for traumatic problems (9). Therefore, the pilgrims are at risk for different traumatic problems in Hajj.

A study was conducted in *Al-Nour* specialist hospital in *Mecca*, kingdom of Saudi Arabia during Hajj. In this study, the number of trauma cases who attended the emergency department was 713 patients. Among these patients, 65% had minor trauma, which were discharged from emergency room, and 35% out of them were admitted in different surgical departments and intensive care unit (ICU). Among the admitted pilgrims, 60% were involved in road traffic accidents, 15% had injuries in Holy Haram and 53% had limb fractures (6).

In our study, the most common injuries was "Tissue contusions and ruptures" (about 76/10000), and the second one was "Tendon lesions" (about 62/10000), and the most common mechanism of injuries was "Ankle sprain" (69/10000). There was no any special study for ankle Sprain among Hajj pilgrim population, but according to report of Craing, et al. in the United Kingdom's general population, the prevalence of ankle sprains is 52.7 cases per 10,000 patients (10). Ankle sprain occurs more than 25,000 cases each day (11).

In our study, the frequency of Ankle sprain among the Hajj pilgrims is higher than United Kingdom general population. Perhaps, overcrowding and multicultural situations contribute to this finding. Ankle sprain is important because of the involved pilgrims cannot participate their own to ritual. The most common ankle injury is a lateral sprain, which is due to inversion of the foot (11). Perhaps this problem is due to wearing of inappropriate slippers during Hajj rituals. Therefore, providing of safety slippers is an important protective measure.

“In at least 40% of patients with ankle sprain, the symptoms are left over for 6 months and at least 10% to 20%of them leading to ankle instability, pain or other chronic symptoms” (10).

The most common cause of rib fractures is blunt trauma to the chest wall (12). In our study, the average of "Rib fracture" was 11.65/10000, and the main cause was pressing in over crowding. This finding is compatible with afore mentioned fact.

Sacrifice (slaughtering of animals) is one of the components of Hajj ritual. In one study, it has been reported that, during 4 consecutive years of Hajj, 298 patients with hand injuries related to the slaughtering of animals were attended the emergency rooms (5). In the present study, there was no any patients attended the emergency rooms with hand injuries related to the slaughtering of animals. This finding probably contributes to selecting of expert slaughters and training them by Iranian Hajj Organization managers before the trip. Although, bone fractures are common health problems during Hajj period, but unfortunately there are no any reliable evidences in this ceremony. A study was carried out in England & Wales during the period 1988-1998, among a total of 103052 men and 119317 women, in which, among women, the most frequent fracture sites were the radius/ulna (30.2 cases per 10000 person-year) and femur/hip (17 per 10000 person-year). These frequencies were lower in men (13). In our study, the frequency of "Long bon fractures" were 2.46/10000 and for "Hip fractures", were 1.04/10000. Since our study, was carried out, during about one month, without the consideration of gender, our findings are compatible with afore mentioned study.

Every year, because of overcrowding and miss management of the population density, numbers of pilgrims, have been traumatized or even died during stoning of the symbolic devil. For example, in 1994, 270 pilgrims, in 1998, 180 pilgrims, in 2004, 251 pilgrims and in 2006, 362 pilgrims have been died during this ritual (8). The portion of Iranian pilgrims of this accident were 11 died pilgrims in 2004, 2 died in 2006 and 983 traumatized from 2004 to 2008 (2). In our study, the highest frequency of traumatized pilgrims was related to 2004, (125/10000), but after this year, the trend of injuries during stoning, have been decreasing that is probably due to structural changes of the symbolic devil by Saudi Arabia. Among traumatic patients, orthopedic and neurosurgical cases are more common than the others are, as 83% of the patients are admitted to these two departments (9). This may indicate that, considering of these two specialties for medical team should be supported by managers and the Iranian hospital in Mecca and Medina need to be well-equipped during the hajj time.

Some preventive suggestions:

* We can decrease the rate of injuries by using of *Shariah rules*. For example, If a person because of aging, or suffering from a disease is unable to move to the holy places, he or she can send an agent *(Niyaba)* to perform the rituals for his/her behalf (3).
* Educating the pilgrims before departure to Saudi Arabia.
* Pilgrims should be alert about every overcrowded place.
* Pilgrims should be alert about, the dangerous highways.
* Providing safety conditions specially in baths for pilgrims in order to preventing the sliding.
* Appropriate shoe or slippers wear should be encouraged.
* Providing safety condition for preparing boiled water by pilgrims.
* Use of safety glasses for pilgrims at the time of stoning the symbolic devils.
* Recruiting enough orthopedists for hospitals in Mecca and Medina.

Ethical Considerations

Ethical issues including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc. have been completely observed by the authors.

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