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# Cost for traffic accident related injuries and its comparison it with the national standard: A case study in Iran



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## ABSTRACT

**Introduction:** Since the World Health Organization (WHO) has emphasized the importance of estimating the economic costs and traffic-related injuries the society as well as their roles in the analysis of cost efficiency; traffic-related accidents toll estimation has risen as one of the main concerns of the WHO.

**Materials and methods:** This analytical, descriptive study is an applied research conducted in 2015 in Isfahan province. Among the 35 educational health centers and hospitals in Isfahan, 19 hospitals were selected randomly according to the type of the centers. Information was gathered using traffic accidents system and imported into the Microsoft Excel software. In a country standard, the cost for each patient in traffic accident by NO. 400/11607, dated 9/7/2016 has announced from the Ministry of Health and Medical Education to the Isfahan University of Medical Sciences.

**Results:** The highest average spending per injured patient is in the Imam Musa Kazim hospital, and lowest average spending per patient can be seen in the hospital Behnia Tiran. *(Please elaborate more information in this section)*

**Discussion and Conclusion:** Imam Musa Kazem and Imam Hussein Children's Teaching Hospital including: the high average of staying patients, type and cost of equipment in Al Zahra educational health treatment center, the consuming prostheses and the utilization of capital equipment such as CT scan machine Multi 64 makes to increase the average cost of a patient in centers compared to other health centers. On the other hand, the cost of accidental outpatients is not registered in the system, so these factors make the average cost of hospitals higher than country standard.

**Keywords:** cost, traffic accidents, hospital

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## INTRODUCTION

Yearly, about 1.24 million people around the world lose their lives on the road and 20-50 million people are debilitated because of traffic accidents.<sup>1</sup> Unfortunately, 90% of deaths due to traffic accidents take place in countries with low or middle incomes.<sup>2</sup> Iran is considered to have a high occurrence of traffic accidents with a rate of 33 fatal cases in 100.000 population.<sup>3</sup>

Nevertheless, according to research conducted in 2013, the cost of traffic accidents in Iran was estimated to be about 6.46% of Gross Domestic Product (GDP). This study indicated the satisfactory of people for paying the costs of events.<sup>4</sup> Regulations regarding charges for injuries due to traffic accidents are clearly stated in Article 92 of Iran's Fourth Development Plan and Article 37 of Iran's Fifth Development Plan, According to Article 92 of the Fourth Development Plan, every patient who was injured in traffic accident and brought to the hospital with sufficient evidence must be treated

free of charge. be hospitalized and in the shortest possible time.<sup>5</sup>

To provide the fundings needed to treat traffic accidents casualty, 10% of third-party insurance premium, the passenger and surplus be received by the health insurance companies and be deposited to the account of the Ministry of Health, treatment and medical education to the Treasury General. and the cost of treatment for all traffic injuries, road and driving and other available resources will be paid from the funds deposited. The distribution of resources will be done based on the performance of the basic insurance in every six months by the Ministry of Health and Medical Education.<sup>6</sup>

The results of traffic accidents injuries can be investigated from various aspects, namely health, social, and economic aspects. However, WHO has emphasized the importance of estimating the medical expenses on road accidents and their role in the analysis of cost efficiency. Therefore, estimating the

Results No.	Type of hospital	Hospital name		
1	Teaching hospital	Alzahra, Kashani, Feyz, Kodakan Imam Hossein	Emam Moua Kazem	Amin
2	Non-teaching hospital	Goldis, Amir Almomenin Shahreza	Shahid Ashrafi & Saei, Esabn Maryam, Seyed Alshohada Semerom, Shohada Lenjan, Heshmatie Naeen	Fatemeih Khansar, Behniya Tiran, Hazrate Zahra Zeynabeye, Emam Hossein Golpayegan, Najaf Abad

**Table 1** Comparison of cost per patient based on the information recorded in the system crashes in selected hospitals in Isfahan in 2015

No	Name of the center	Number of patients	The amount recorded in the system crashes	The average cost per patient
1	Alzahra	5216	4383078	840
2	Kashani	8115	4130900	509
3	Emam Musa Kazem	126	324868	2578
4	Feyz	42	17241	410
5	Amin	6009	2644026	440
6	Shahid Ashrafi&Saei	4402	891273	202
7	Fatemiye Khansar	191	20433	107
8	Goldis Shahinshahr	1827	293842	161
9	Almomenin Shahreza	1977	928460	470
10	Esabne Maryam	902	221136	245
11	Seyed Alshohada Semerom	876	60098	69
12	Heshmatie Naeen	1232	88257	72
13	Behniya Tiran	1052	28911	27
14	Hazrate Zahra Zeynabeye	24	1876	78
15	Emam Hossein Golpayegan	803	81464	101
16	Kodakan Imam Hossein	29	41906	1445
17	Mohamad Montazeri Najafabad	5327	2091350	393
18	Shohada Lenjan	2126	430763	203
19	Emamkhomeini Falavarjan	2658	480525	181

costs resulting from road traffic accidents is one of the most important issues for WHO.<sup>7</sup>

Due to WHO's highlight on costs of traffic injuries, the government focused attention on controlling the costs of injuries resulting from accidents and equitable allocation of resources among patients. Accordingly, this study aimed to estimate

the cost of treatment of each traffic-related injuries, in comparison with the national standard in 2015, as well as to determine the causes of possible differences found. It is hoped the results of this study could benefit the policy-makers in organizing effective steps to reduce the costs of traffic injuries treated in hospitals.

## MATERIAL AND METHODS

This analytical, descriptive study is an applied research that was conducted in 2015 at Isfahan Province. Among 35 educational health treatment centers in Isfahan province, 19 hospitals were chosen using cluster random sampling method, based on the types of the centers. The centers are classified based on the hospital types (teaching hospital and non-teaching hospital), geographical coverage area by the hospital's accident-prone divided into subcategories then the centers and hospitals were selected in the following table.

The number of injuries and the total cost for injured patients were determined randomly in 2015 by utilizing traffic accidents system in the Ministry of Health. Subsequently, the average expenditure of traffic accident patients in each hospital in 2005 was derived from the information provided. The country standard has announced the costs for each patient in traffic accidents by No. 400/11607, dated 9/7/2016 from the Ministry of Health and Medical Education to the Isfahan University of Medical Sciences, with the average of 426 per patient. After collecting the information needed, the data was imported into the Microsoft Excel software to be analyzed and compared with the national standard.

Based on the table above the lowest amount of patients recorded in the system crashes during the year 2015 is Hazrat Zahra Zainabiyya, and the most patients were recorded in Al-Zahra Hospital.

Based on the graph above, the highest average spending per injured patient is in the hospital Imam Musa Kazim, and lowest average spending per patient can be seen in the hospital Behnia Tiran.

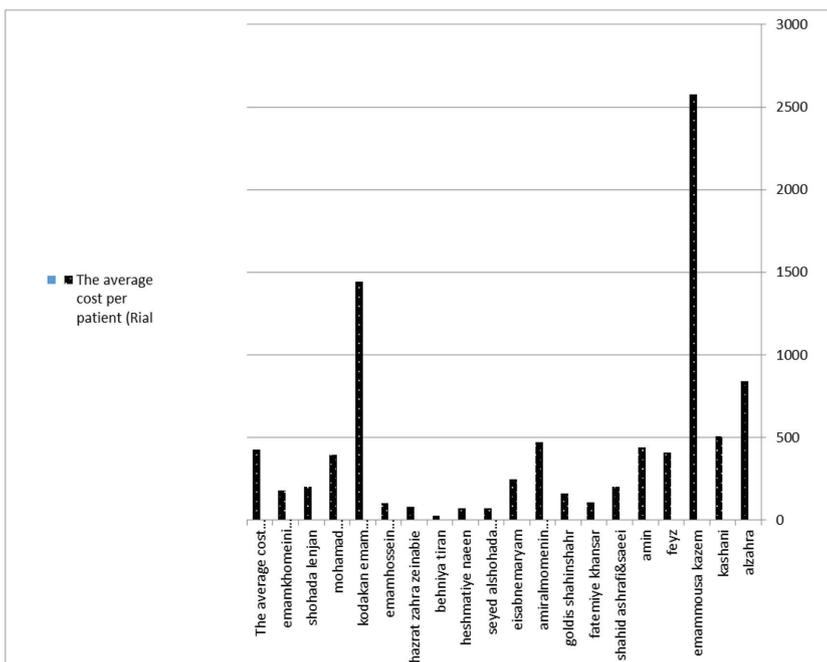
According to the information from Table 2 and Figure 1, the most difference between the traffic-related injuries treatment costs in the hospitals compared to the national standard are found in the following order: Imam Musa Kazim, Imam Hussein Children's Hospital, Al Zahra, Kashani, Amir Almomenin in Shareza and Amin, respectively.

## DISCUSSION AND CONCLUSION

Several randomized controlled trials to evaluate the cost of treatment for traffic-related injuries had

**Table 2** Difference between the amount spent per injured patients and national standards in selected hospitals in Isfahan in 2015

No.	Hospital Name	The average cost per patient	The difference between the cost of a national standard
1	Alzahra	840	-414
2	Kashani	509	-83
3	Emam Musa Kazem	2578	-2152
4	Feyz	410	16
5	Amin	440	-14
6	Shahid Ashrafi & Saei	202	224
7	Fatemiye Khansar	107	319
8	Goldis Shahinshahr	161	265
9	Almomenin Ahahreza	470	-43
10	Esabne Maryam	245	181
11	Seyed Alshohada Semerom	69	358
12	Heshmatie Naeen	72	355
13	Behniya Tiran	27	399
14	Hazrate Zahra Zeynabeye	78	348
15	Emam Hossein Golpayegan	101	325
16	Kodakan Imam Hossein	1445	-1019
17	Mohamad Montazeri Najafabad	393	34
18	Shohada Lenjan	203	224
19	Emamhomeini Falavarjan	181	245

**Figure 1** Comparison of cost per patient and comparison with national standards in selected hospitals in Isfahan in 2015

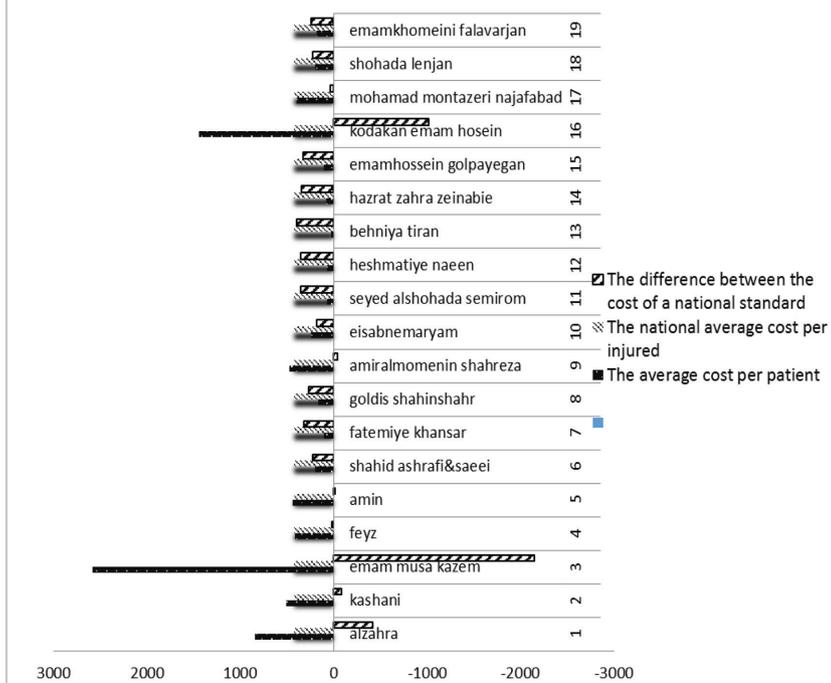
been performed in different countries. A study by Van Beek et al. from the Netherland showed that the cost of traffic accidents injuries is one of the main causes of economic loss in the country.<sup>8</sup> Another study by Kennely et al. showed that the cost of treatment for traffic accidents injuries in Australia was about \$ 17 billion per year, which is about 2.3% of GDP.<sup>9</sup> In a study conducted in India, more than one million people were injured in road accidents annually, costing about 55,000 rupees, which is equivalent to 2-3 percent of GDP.<sup>10</sup> In Ireland, Sheridan et al. showed that the average cost of outpatient treatment due to traffic accidents in the hospital was £ 6395 in per discharge.<sup>11</sup> Carlos Gumnz et al. evaluated six hospitals in Bogota Colombia city in his study and estimated the average cost of medical care for traffic-related accidents patient was 1349 pesos (USD).<sup>12</sup> In a study carried out by Garcia Altz et al. stated that the annual cost of traffic-related accidents is about \$ 329 million.<sup>13</sup>

In Iran, the annual mortality rate of traffic accidents was 44 in one hundred thousand of population. That was more than the death toll in Bam earthquake in 2003.<sup>14</sup> The studies in our country were done in order to estimate the costs due to traffic accidents. The economic burden studies in 2007 have estimated the annual direct and indirect costs of traffic accidents in Iran to be around 180 trillion rials (about 23.6% of GDP).<sup>15</sup> The total cost of treatment for traffic injuries was estimated to exceed 111000 billion rials in 2011 (4.4 million USD). This amount is equivalent to 75% of the total healthcare budgets of Iran in 2011.<sup>1</sup> One study in Tehran also revealed that with a monthly incidence rate of 500 traffic-related accidents in a teaching hospital, the average cost of treatment per patient was \$ 1622.1.<sup>2</sup>

In this study, the highest difference in comparison with the national average treatment cost of each injured traffic accidents in 19 hospitals in Isfahan province was found in Imam Musa Kazim Hospital, followed by Imam Hussein Children Hospital and Al Zahra hospital in the second and third place. In the study of documents from accidental patients, as mentioned above, the following results have been obtained that due to the reasons, it is reasonable to be higher than the average cost for each patient in Imam Hussein Children and Al Zahra centers compared to the national average.

Al Zahra Education and Treatment Center contains 750 active beds, about 90 emergency beds, 48 specialty and subspecialty wards, and 27 operating rooms. As a level-three referral center, this facility is also supported with 250 faculties and

Figure 1: Compare the difference between the cost of a national standard in selected hospitals in Isfahan in 2015



33 departments to provide the capability to have a large volume of accident-related patients admitted (monthly average of 435 traffic accident-related patients) from both the city and neighboring provinces. With regard to the education and referrals of the center, type of surgery required for patients with accident-related injuries referred to the center, as well as the type and cost of equipment and prostheses for their consumption such as CT scan machine Multi 64, the average cost of a patient increasing in the center compared to other medical centers and over this center have been incurred deduction for accidental cases after applying fee for doctors and personnel. Therefore, it is suggested that the cost of a patient at this center compare with the other centers at the same level and trusted experts of ministry should be present in order to investigate details of the cases and to prevent any possible losses.

### Imam Hussein Children Education and Treatment Center

This center is the only children surgery center in Isfahan and its neighboring provinces. According to the studies from accidental patient record revealed that the number of patients registered in 2015 in traffic injuries system was 29 cases and the number of accidental patients was 31 cases that 2 cases in the amount of 9941530 have not been registered in the system. According to the average stay of patients in center is 7.9 days for each patient and on the other hand, be hospitalized in ICU due

to the highly specialized surgical procedures in one case, the patient was hospitalized in children ICU and because of being low number accidental patients in hospital, the average cost of the center is higher than the national average.

### Imam Musa Kazim Education and Treatment Center

This is the only burn center in Isfahan and its neighboring provinces. Based on the medical records of traffic-related accidents in patients, the following results might be responsible for the higher average treatment cost compared to the national standard,

1. Failure to register 242 temporary hospitalized patient (fewer than 6 hours) and outpatient continue the treatment in Ministry of Health system to the amount of 85,401,239 Rials that increases the average cost of dossier in the center.
2. Long-term hospitalization of patients in burn wards, ICU and being different in tariff bed in burn centers with other centers and general hospital.
3. Top of the average stay of patients in the center (7.5 for each patient).
  - 100 patients had resided for 10 days.
  - 14 patients had resided for 20 days.
  - 4 patients had resided for 30 days.
  - 6 patients had resided for 40 days.
  - 2 patients had resided for 50 days.

(Please present the data in a table form)

In the Isfahan province, only the temporary and permanent of inpatient cost have not been registered in the accidental system and outpatient of accidental patients including treatment follow-up period. For this reason, based on the reducing of patients, the average cost of hospitals in the province is higher than the country standard; therefore, the cost of outpatient should be registered in Ministry system in order to reduce the cost of traffic-related injuries treatments from the country standard. It is hoped that by applying the results of the study, the managers take measures in order to reduce the cost of traffic accidents injuries.

### ACKNOWLEDGMENT

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### RESEARCH LIMITATIONS

The researchers faced some problems in collecting information on traffic-related injuries expenses

and other information, such as the lack of adequate date-recording in systems and difference between the amount of system and HIS, so the problems have been resolved by updating the traffic accidents system.

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