

## Study of the pattern of mortality caused by Traffic Accidents (TAs) in The South of Iran

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### Abstract

**Objective:** To investigate the pattern of mortality caused by road traffic accidents and its associated factors.

**Methods:** The retrospective cross-sectional study was conducted in the Fars province of Iran and comprised data of all people having died in road traffic accidents from March 21, 2011, to March 19, 2012. Using census method, all files related to deaths in road accidents were reviewed at the Legal Medicine Centre. Data was analysed using SPSS20.

**Results:** Of the 1668 people dead, 1291(77.4%) were male and 377(22.6 %) were female. The highest rate related to the age group 21-30 with 454(27%) killed. As for education level, the highest rate of mortality was 410(24.5%) for illiterate people and the least was 9(0.5%) for those having Masters degree or higher. In terms of time of year, the highest rate of mortality was 167(10%) between August 23 and September 22, while the least was 82(5%) between July 23 and August 22. Head trauma was reported as the most important cause of death in 1191(71.4%) cases.

**Conclusion:** Despite some minor differences, all provinces in Iran have the same patterns of death related to road traffic accidents.

**Keywords:** Traffic accidents, Pattern of mortality, Fars province. (JPMA 66: 644; 2016)

### Introduction

Mortality caused by road traffic accidents (RTAs) is one of the most important unintentional incidents in the world. In 2012, 1.2 million people died in RTAs all over the world. Furthermore, about 50 million people are injured in such accidents annually.<sup>1</sup> By the year 2030, RTAs will be among the seven main causes of mortality in the world.<sup>2</sup> Epidemiological studies of accidents around the world suggest a high number of deaths, especially among youths and adult men.<sup>3-6</sup>

Likewise, RTAs are among the main concerns of general health in Iran.<sup>7</sup> Even though mortality caused by RTAs has decreased in recent years, accidents still account for 14.8% of adult mortality and RTAs account for 8.9% of mortality.<sup>8</sup> Also, statistics have shown that the mortality rate from RTAs in Iran is 43.8% per 100,000 men, placing Iran in the 5th place among all the countries.<sup>9</sup> Several

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studies have been carried out in the field of RTA mortality in Iran. Studies in Iran also show that most victims were men under 40 years of age;<sup>10,11</sup> the main reason of deaths in RTA was head trauma;<sup>12</sup> and more accidents resulting in death occurred in autumn and winter.<sup>13</sup>

RTAs can have economic, social, and physical consequences. The main expense of RTAs is on the shoulders of countries with low health, economic and social capabilities.<sup>14</sup> A study warned that "if accidents continue to be the leading cause of fatalities by injury, the consequences could lead to traffic injuries becoming a top contributor to the global financial burden problem by the year 2020".<sup>15</sup> Mayoust et al. indicated that one-third of the participants reported legal, social, and psychological consequences over time.<sup>16</sup> Another study investigated the relationship between quality of life and post-traumatic stress disorder, anxiety, and depression after traffic-related injuries. The findings showed a positive correlation between depression and post-traumatic stress disorder. Wang et al. also concluded that TAs had a reverse impact on psychological welfare.<sup>4</sup> Similarly, Jafari et al. conducted a national study using World Health Organisation (WHO) guidelines regarding the burden of diseases and injuries in 2003, showing that the main reason for men's Disability Adjusted Life Years (DALYs) was damages and injuries in RTAs.<sup>17</sup>

During recent years, Fars province has recorded the

highest rate of car accident mortality in Iran. Fars is located in the south of Iran and is the 5th biggest province. Based on the statistical data of Forensic Medicine Organisation of Iran in 2011-2012, the highest rate of mortality caused by RTAs was recorded in Fars province.<sup>18</sup>

Considering the importance of relevant data for planning and improving health promotion interventions, the current study was planned to investigate the pattern of mortality caused by RTAs in the southern region of Iran.

## Materials and Methods

The retrospective cross-sectional descriptive study was conducted in the Fars province of Iran and comprised data of all people having died in RTAs from March 21, 2011, to March 19, 2012. After obtaining permission from the relevant authorities Forensic Medicine Organisation centres in Fars province were approached and classified data was accessed. Details were recorded according to a checklist based on month of registration of death, age, gender, education level, marital status, place of residence, time of accident, type of the road, accident's reporter, casualties transfer mode, final cause of death, trauma location, place of death, colour of clothing, how the crash happened, type of car, location of the crash, and casualty's status.

Data was analysed using SPSS20 and descriptive statistics (frequency, percentage, mean, and standard deviation) and correlation coefficients were calculated. Further, relationships between study variables were tested using Cramer's V coefficient, as a measure of nominal association. Considering the large number of variables, only the results of correlations among the major variables were reported, indicating a significant relationship between the final cause of death and type of car (Cramer's

$V=0.107, p<0.01$ ).

## Results

Of the 1668 people dead, 1291(77.4%) were male and 377(22.6%) were female. The highest rate related to the age group 21-30 with 454(27%) killed. As for education level, the highest rate of mortality was 410(24.5%) for illiterate people and the least was 9(0.5%) for those having Masters degree or higher (Table-1).

In terms of time of year, the highest rate of mortality was 167(10%) between August 23 and September 22, while the least was 82(5%) between July 23 and August 22. Besides, 965(58%) people died in RTAs during the day, while 497(30%) died at night (Table-2). Head trauma was the major cause of death in 1191(71.4%) cases (Figure).

With regard to the car types, 736(44.1%) were in sedans, 430(25.8%) were on motorcycles, and 281(16.8%) were pedestrians. In addition, 866(51.9%), 663(39.7%) and 70(4.2%) deaths were reported by the present officer, police station, and hospital, respectively. Besides, 1425(85.4%), 179(10.8%) and 29(1.7%) injured individuals were transferred by ambulances, other vehicles and police vehicles, respectively. Considering the location of death, 954(57.2%), 583(35%), and 111(6.7%) deaths occurred on the accident scene, in hospital, and during transfer, respectively (Table-3).

In the second phase of the study, relationships between the study variables were tested and it was found that 170 (60%) of the deceased pedestrians died because of head trauma. This rate was 532 (72.7%) for sedans, 34 (79.5%) for motorcyclists, 8 (100%) for mini-buses, 15 (68%) for buses, 58 (65%) for pickup trucks, 10 (47%) for mini-trucks, 17 (70%) for trucks, 85% for bicyclists, 5 (71%) for farming

**Table-1:** Demographic characteristics.

Age group					Frequency (%)					
One day - 10 years old	11-20 years old	21-30years old	31-40 years old	41-50 years old	51-60 years old	61-70 years old	70 years old and over 70	Missing data		
125(7.5%)	454(27.2%)	253(15.2%)	192(11.5%)	172(10.3%)	107(6.4%)	204(12.2%)	159(9.5%)	2(0.1%)		
Marital status					Frequency (%)					
Single	Married	Unknown	Missing data							
663(39.7%)	979(58.7%)	4(0.02%)	22(1/3%)							
Education level					Frequency (%)					
Illiterate	Primary school	Middle school	High school	High school graduated	University graduated	A.D.	B.A.	M.A and higher	Un known	Missing data
410(24.6%)	321(19.2%)	367(22%)	139(8.3%)	238(14.3%)	49(2.9%)	33(2.2%)	58(3.5%)	9(0.5%)	18(1.1%)	26(1.6%)
Gender					Frequency (%)					
Male	Female									
1291(77.4%)	377(22.6%)									
Place of residence					Frequency (%)					
City	Village	Others	Unknown	Missing data						
1000(60%)	618(37.1%)	13(0.08)	15(0.9)	22(1.3%)						

**Table-2:** Descriptive statistics.

Age group		Frequency (%)					
21st March-22nd July 549(33.7%)	23rd July-22nd October 564(33.81%)	23rd October-19th March 477(28.7%)				Missing Data 78(4.7%)	
<b>Time of accidents</b>							
During the day 965(57.9%)	At night 497(29.8%)	Sunrise or Sunset 176(10.6%)	unknown 14(0.8%)	Missing data 16(1)			
<b>Colour of clothing</b>							
Dark 137(8.2%)	Light 147(8.8%)	Unknown 35(0.5%)	Missing data 1349(80.9%)				
<b>Place of accident</b>							
Inside the city 485(29.1%)	Outside the city 1017(61%)	Other 135(8.1%)	Unknown 31(1.9%)				
<b>Road type</b>							
Freeway 15(0.9%)	Highway 90(5.4%)	Main road 1041(62.4%)	Side road 142(8.5%)	Village road 143(8.6%)	Other 22(1.3%)	Unknown 4(0.2%)	Missing data 211(12.6%)
<b>Deceased individual's status</b>							
Driver 695(41.7%)	Passenger 641(38.4%)	Pedestrian 307(18.4%)	Unknown 20(1.2%)	Missing data 5(0.3%)			
<b>Location of trauma</b>							
Head and face 1181(70.8%)	Neck 31(1.9%)	Chest and stomach 125(7.5%)	Hand and arm 13(0.8%)	Back and spine 2(0.1%)	Hip and legs 20(12%)	Multiple reasons 290(17.4%)	Missing data 6(0.04)

**Table-3:** Nature of Accidents.

How the accident happened	Frequency (%)
Crash of vehicles with each other	859(51.5%)
Crash of a vehicle with a pedestrian	304(18.2%)
Crash of a vehicle with an object	89(5.3%)
Crash of a vehicle with an animal	5 (0.3%)
Overturn of the vehicle	367(22%)
Fall of the vehicle	17(1%)
Fire	1(0.1%)
Others	5(0.3%)
Unknown	15(0.9%)
Missing data	6(0.4%)

machines, 2 (100%) for tank trucks, and 2 (100%) for road construction machineries. Furthermore, 2 (100%) of the deceased by fire were passengers of sedans.

There was a significant relationship between the final cause of death and how the accident happened (Cramer's  $V=0.107$ ;  $p<0.01$ ). Accordingly, 624 (52%) of the individuals died due to head trauma in direct accidents between two vehicles, 283 (23.8%) died due to overturning of vehicles, and 180 (15.9%) were pedestrians.

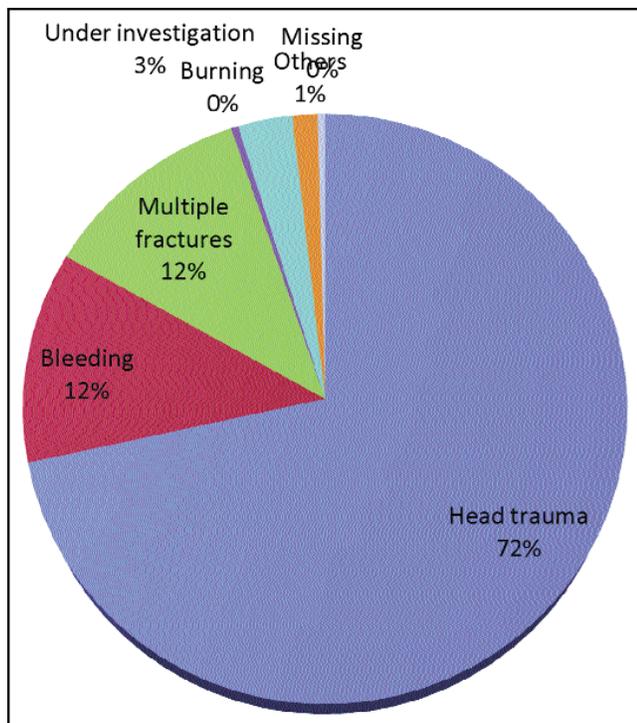
The relationship between the type of car and location of death was significant (Cramer's  $V=0.29$ ;  $p<0.01$ ). The results showed that 480(65.3%) of the deceased individuals in sedans died on the accident scene. This rate

was 1 (14%) for bicyclists, 204 (47.6%) for motorcyclists, 16 (72%) for buses, 19 (90.5%) for mini-trucks, 14 (58.3%) for trucks, 4 (50%) for mini-buses, 4 (57%) for farming machines, 1 (50%) for road construction machineries, 18 (85%) for trailers, 2 (100%) for tank trucks, 1 (100%) for ambulances, and 123 (43.8%) for pedestrians.

There was also a strong significant association between the type of car and how the accident happened (Cramer's  $V=0.43$ ;  $p<0.01$ ). In crashes between two vehicles, the highest rates belonged to sedans 434 (50.5%) and motorcycles 327 (38.7%). The accident rate in sedans also stood first in other forms of accidents, such as 42 (47.2%) in crash of a vehicle with an object, 225 (61.3%) in vehicle overturn, 7 (41.2%) in vehicle fall, and 1 (100%) in fire. In vehicle fall, the highest mortality rate related to sedans 7 (41.2%) followed by buses 4 (23.5%). The majority of the deceased individuals whose accident cause was crashing with an animal were motorcyclists 3 (60%).

Concerning the road type and time of the accident, main roads had the largest number of losses in different times of the day. The highest percentage of losses during different times of day happened at night, in day, and at sunrise or sunset (Cramer's  $V=0.22$ ;  $p<0.01$ ).

There was a significant association between the location of accident and the type of car (Cramer's  $V=0.22$ ;  $p<0.01$ ). On city roads, the highest percentage of losses was reported for pedestrians 162 (33.7%), motorcyclists 161



**Figure:** The percentages of the final causes of death.

(33.5%), and sedans 128(26.6%). On the roads outside the city, the highest percentage related to sedans 561 (55.5%) and motorcyclists 205 (20.3%).

A total of 682 (98.1%) deceased drivers were men and only 13 (1.9%) of the deceased were women. Men and women comprised 203 (66.1%) and 104 (33.9%) of the deceased pedestrians, respectively. Also, 384 (59.9%) and 257 (40.1%) of the deceased car passengers were male and female, respectively (Cramer's  $V=0.43$ ;  $p<0.01$ ).

## Discussion

The present study was planned to investigate the pattern of mortality caused by RTAs and its associated factors in Iran's Fars province.

The results were compatible with those of the studies conducted on accidents in Iran and other parts of the world. In many cases, the results confirmed the fixed pattern of accident mortality in different parts of the world. For instance, the highest mortality rate was related to the 21-30 years age group. Similar results have been reported by several studies<sup>3-6,13,19-22</sup> with some minor differences. The results of another study in Iran showed that the highest rate of motorcyclists' accidents was related to age group below 30.<sup>22</sup> The results of a study in

Kenya also indicated that more than 75% of traffic motorcycle accidents involved youths below age 30.<sup>23</sup> A study conducted in Australia showed that during the preceding 10 years, 17-25 years age group comprised the largest number of casualties in accidents.<sup>24</sup> Nevertheless, a study carried out in China reported that the highest rate of mortality occurred in individuals between 31 and 40 years age.<sup>25</sup> Our results showed that the mortality rate was 3.5 folds higher in men compared to women. Yet, Fanian et al. reported this rate to be 5 times higher among men.<sup>19</sup> The study performed in China also reported this rate to be 3 times higher in men.<sup>25</sup> In Australia, too, men constituted 72% of the losses.<sup>24</sup> Studies conducted in Bhopal and Qom also indicated that the majority of events involved men.<sup>6,13</sup> Considering the fact that based on society norms and occupational status, men constitute the largest number of drivers, and these statistics seem logical.

The current study demonstrated that head trauma was the most important cause of death in RTAs. This has been confirmed in similar studies in Iran and elsewhere.<sup>19,20</sup> Similarly, head injury was quite common in a study in Bhopal<sup>6</sup> and was the main cause of death in another study.<sup>13</sup> The high rate of mortality among cyclists and especially motorcyclists can be due to not using helmets. Helmets can be very helpful in saving cyclists and motorcyclists. Besides, losses in sedans are in most cases due to not fastening seatbelts. Unfortunately, in this study, we did not have access to the statistics on the rate of using seatbelts among the deceased individuals. Yet, it seems that one of the most important fatal factors in accidents, especially overturns, is the lack of seatbelt usage.

Our study indicated that illiterate individuals comprised the majority of losses in comparison to other educational groups. Other studies have also reported similar results.<sup>19,26,27</sup> Besides, a study in Nepal showed that most victims were from low- and middle-income families.<sup>5</sup> This can be due to the fact that most drivers whose main career is driving are illiterate or do not have academic degrees. Indeed, it seems that psychological factors, such as speed of reaction and concentration, are higher in educated individuals and, consequently, cognitive errors and absent-mindedness can be less determining in these people.

The results of a study in China revealed that most accidents happened during the day.<sup>25</sup> In another study, 6pm to 12pm was the peak time of RTA occurrence.<sup>6</sup> Our study findings indicated that most losses on all types of roads happened during the day. The main reason could be the greater traffic volume during the day. Secondary factors, such as speeding, illegal overtaking, and left shift, can be added as well. After day time, the largest number

of fatal crashes occurred during late night. This can be due to two factors; the first of which being drivers' sleepiness. The second reason is that roads and accident-prone zones are not compatible with the standards of roads in daylight. Yet, some measures, such as enhancing the light on high-traffic roads and installation of caution and warning luminous signs on the roads can be effective in reducing the impact of this variable.

On city roads, pedestrians constituted most of the casualties. One study also reported that most of the deceased individuals due to RTAs were pedestrians or car passengers.<sup>10</sup> Consistently, a study in Kenya indicated that pedestrians and passengers were most vulnerable to die in RTAs.<sup>3</sup> Similar results were also obtained in a survey in China.<sup>25</sup> These statistics could be reduced through enhancing the safety of sidewalks, increasing the number of pedestrian bridges, installing speed bumps in crowded areas, and providing the necessary trainings.

In the current study, the highest loss rates were related to sedans and motorcycles. For sedans, this can be due to the fact that the number of these vehicles is much higher in comparison to other types of vehicles. For motorcycles, on the other hand, it can be due to the large number of roads and village ways in Fars province. Although the main problems on the roads of this province were related to sedan and motorcycle accidents, but the losses caused by heavy vehicle accidents should not be neglected. Statistics have shown that many drivers of heavy vehicles and buses in Iran experience more than one accident annually. On average, one truck is engaged in every four accidents and a bus is engaged in every 12 accidents, with the average of 5 dead and 12 injured people.<sup>28</sup> Hence, despite the fact that the percentage of heavy vehicles accidents is much lower compared to sedans, unfortunately, the loss rates of such accidents are very noteworthy. Another study in Iran also showed that the drivers of heavy vehicles committed more traffic crimes in comparison with the drivers of light vehicles. This can be attributed to the cognitive impairments of this group of drivers. It is even more worrying when the rate of driving offences and intentional violations seem to be more frequent among bus drivers who are responsible for the lives of many people.<sup>29</sup> Hence, it is highly essential to concentrate on the selection of these professional drivers and modification of their driving behaviours.

One of the limitations of this study is not having access to the statistics of drivers' sleepiness, wearing seatbelts, using helmets, guiltiness of the deceased individuals, and consumption of alcoholic drinks. In case these statistics were available, we could doubtlessly have conducted a

more precise analysis on the causes of mortality.

## Conclusion

Fars is one of the most accident-prone provinces of Iran. Generating a proper driving culture with the use of health-enhancement interventions, strict enforcement and enactment of more strict traffic rules, and providing long-term basic training through coordination among different sections of society can play an important role in decreasing the incidence rate of accidents and related mortality.

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