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Original Article

Epidemiology of transport accidents based on international statistical classification of diseases (ICD-10) in Mashhad, Iran

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Abstract

Background: Road accidents are one of the main causes of death worldwide and the second cause of death in Iran. This study aimed to investigate the epidemiology of transport accidents based on the International Statistical Classification of Diseases and Related Health Problems (ICD-10) in patients who referred to trauma department of academic hospitals affiliated with Mashhad University of Medical Sciences in the northeast of Iran. **Materials and Methods:** This retrospective cross-sectional study was performed from March 20, 2013, to March 20, 2014. The study population included all records of inpatients referred due to transport accidents (9162 cases), to the three specialized trauma hospitals. **Result:** Majority of the patients involved in transport accidents were men (75%). Most transport accidents included motorcycle riders (39.36%), car occupants (26.21%) and pedestrians (24.82%), respectively. Most of the accidents occurred in summer (33.2%) and spring (26%). Majority of the accidents occurred between 6 PM to 8 PM, and fewer accidents occurred in the early hours of the day. **Conclusion:** Policymakers should consider more, groups at high risks, such as pedestrians and motorcyclist.
Keywords: ICD-10, Transport Accident, Epidemiology, Iran

Introduction

Road accidents are an important cause of premature death around the world (1). Approximately, 1.2 million people die each year on the roads worldwide (2). Several million people are injured or disabled due to road traffics accidents (TAs) worldwide (3), and about 70% of traffic deaths occur in developing countries (4). Iran has a high incidence of road accidents and fatalities; about 22,918 deaths were recorded in 2007-2008 (5). TAs are considered as the second leading cause of death in Iran (6).Reports show that there are great concerns about road safety in developing countries (7). Road accidents are a serious public health problem in Iran. Previous studies indicated that several reasons, such as the young population of the country, low-price of gas, moderate use of public transport vehicles, and non-standard safety plans were reported for accidents (8). The most important factors involved in driving accidents include driving behaviors such as speed, drunk while driving, driving with fatigue, and lack the use of protective equipment (9). Road traffic accidents are predicted to be the seventh cause of death worldwide by 2030 (6). The International Statistical Classification of Diseases and Related Health Problems, tenth revision (ICD-10), has been made to classify diagnoses and other health-related data of patients hospitalized as alphanumeric codes. Using data coded according to the ICD-10 facilitates obtaining morbidity information in a standard format and enhance the collection, storage, and analysis of comparable data among countries (10). One hundred and ten countries use the ICD-10 for coding mortality, and more than 20000 scientific papers have cited it (11). In the 20th chapter of ICD-10, codes describe the external causes of diseases and mortality; this chapter separates surrounding elements of injuries' events including

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the causal mechanisms such as TAs, place of occurrence of the injuries and the activity at the time of injury (e.g., working for income) (10). This study was conducted to investigate the epidemiology of TAs based on the codes of the ICD-10 in patients admitted to trauma specialized academic hospitals affiliated to Mashhad University of Medical Sciences (MUMS) in the northeast of Iran.

Materials and Methods

This retrospective cross-sectional study was performed from March 20, 2013, to March 20, 2014. The study population included all records of inpatients referred due to TA (9162 cases), to three specialized trauma hospitals (Shahid Kamyab, Imam Reza and Taleqani) affiliated to MUMS in the northeast of Iran. The MUMS is one of the most prominent universities in Iran with 7000 students in the different fields of medicine and several academic hospitals, and responsible for health care of 3,312,090 inhabitants. This study was comprised of only hospitalized patients and outpatients referred to the ambulatory department were excluded. The 20th chapter of ICD-10 is about external causes of diseases and mortality. In the present study, based on the ICD-10, all codes of TAs were categorized according to the codes blocks (V01–V99). Then, based on these codes, required information was derived from inpatients' records by trained coding experts. The fourth character of codes was not considered for reporting because most had the fourth digit 9 (unknown regarding persons injured such as passenger or driver). Data were analyzed using descriptive statistics with SPSS version 11.5 (Chicago, IL). Also, our study was approved by the ethical committee of MUMS (ethical code: IR.MUMS.REC.1394.750).

Result

The total number of TAs (9162 cases) formed 23.63% of all the external causes of diseases and injuries during the study period. Majority of the people involved in TAs were men (75%). According to the codes blocks of the 20th chapter ICD-10, type of victims and mode of transport are presented in Table-1. Most TAs involved motorcycle riders (39.36%), car occupants (26.21%), and pedestrians (24.82%). The mean age of occupants of pick–up or van, occupants in other and unspecified TAs, and motorcyclists were 29.3, 30.3, and 30.6, respectively. Also, the highest mortality rate of TAs was related to motorcyclists (37.4%) and pedestrians (32.2%). As shown in Table-2, the majority of the occupants of

Table 1. The Number of Victims and Mode of TAs According to Codes Blocks of the ICD-10

Codes blocks*	Victims and mode of TAs	n (%)	Sex n (%)		Age	Mortality n (%)
			Male	Female	Mean (SD)	
V01-V09	Pedestrian injured	2274(24.82)	1511(66.5)	763(33.5)	37.3(23.5)	74(32.2)
V10-V19	Pedal cyclist injured	194(2.12)	186(95.9)	8(4.1)	31.5(23.7)	2(0.9)
V20-V29	Motorcycle rider injured	3606(39.36)	3251(90.2)	355(9.8)	30.6(14)	86(37.4)
V30-V39	Occupant of three-wheeled motor injured	3(0.03)	2(66.7)	1(33.3)	50.3(7.6)	-
V40-V49	Car occupant injured	2419(26.21)	1455(60.1)	964(39.9)	35.8(17)	49(21.3)
V50-V59	Occupant of pick – up or van injured	3(0.03)	2(66.7)	1(33.3)	29.3(4.5)	-
V60-V69	Occupant of heavy transport vehicle injured	38(0.41)	28(73.7)	10(26.3)	33.1(15.1)	1(0.4)
V70-V79	Bus occupant injured	6(0.07)	2(33.3)	4(66.7)	46.7(5.8)	-
V80-V89	Other land TAs	409(4.46)	276(67.5)	133(32.5)	33.9(19.8)	15(6.5)
V90-V94	Water TA	2(0.02)	1(50)	1(50)	55.5(27.6)	-
V98-V99	Other and unspecified TAs	208(2.27)	166(79.8)	42(20.2)	30.3(16.2)	3(1.3)
Total	-	9162(100)	6880(75)	2282(25)	-	230(100)

Table 2. The Number of Victims and Mode of Transport According to the Three-Character Level of ICD-10

ICD-10 code blocks*	n (%)	Three-Character Code*	Types of Vehicles	n (%)
V01-V09 (pedestrian injured)	2274 (24.82)	V01	In collision with pedal cycle	6 (0.07)
		V02	In collision with two- or three-wheeled motor	562 (6.13)
		V03	In collision with car, pick-up truck or van	1643 (17.93)
		V04	In collision with heavy transport vehicle or bus	49 (0.53)
		V06	In collision with other non-motor vehicles	2 (0.02)
		V09	In other and unspecified TAs	12 (0.13)
V10-V19 (pedal cyclist injured)	194(2.12)	V11	In collision with other pedal cycles	1(0.01)
		V12	In collision with two- or three-wheeled motor	24 (0.26)
		V13	In collision with car, pick-up truck or van	103 (1.12)
		V14	In collision with heavy transport vehicle or bus	3 (0.03)
		V17	In collision with fixed or stationary objects	1 (0.01)
		V18	In non-collision transport accident	62 (0.68)
V20-V29(motorcycle rider injured)	3606 (39.36)	V20	In collision with pedestrian or animal	14 (0.15)
		V22	In collision with two- or three-wheeled motor	255 (2.78)
		V23	In collision with car, pick-up truck or van	2018 (22.03)
		V24	In collision with heavy transport vehicle or bus	40 (0.44)
		V25	In collision with railway train or railway vehicle	2 (0.02)
		V26	In collision with another non-motor vehicle	9 (0.10)
		V27	In collision with a fixed or stationary object	30 (0.33)
		V28	In non-collision transport accident	932 (10.17)
		V29	In other and unspecified transport accidents	306 (3.34)
V30-V39 (occupant of three-wheeled)	3(0.03)	V33	In collision with car, pick-up truck or van	3 (0.03)

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V40-V49 (car occupant injured)	2419 (26.21)	V40	In collision with pedestrian or animal	1 (0.01)
		V42	In collision with two- or three-wheeled motor	5 (0.05)
		V43	In collision with car, pick-up truck or van	1064 (11.61)
		V44	In collision with heavy transport vehicle or bus	78 (0.85)
		V47	In collision with a fixed or stationary object	263 (2.87)
		V48	In non-collision TAs	915 (9.99)
		V49	In other and unspecified TAs	93 (1.02)
V50-V59 (occupant of pick –up truck or van	3 (0.03)	V58	In non-collision TAs	3 (0.03)
V60-V69 (occupant of heavy transport injured)	38(0.41)	V63	In collision with car, pick-up truck or van	2 (0.02)
		V64	In collision with heavy transport vehicle or bus	21 (0.23)
		V67	In collision with a fixed or stationary object	4 (0.04)
		V68	In non-collision TAs	10 (0.11)
		V69	In other and unspecified TAs	1 (0.01)
V70-V79 (bus occupant injured)	6 (0.07)	V74	In collision with heavy transport vehicle or bus	2 (0.02)
		V78	In non - collision TAs	3 (0.03)
		V79	In other and unspecified TAs	1 (0.01)
V80-V89 (other land TAs)	409 (4.46)	V80	Animal-rider injured in TA	2 (0.02)
		V81	Occupant of railway train or railway vehicle injured in TAs	1 (0.01)
		V82	Occupant of streetcar injured in accident	1 (0.01)
		V84	Occupant of special vehicle mainly used for agriculture, injured in TA	2 (0.02)
		V87	Traffic accident of specified type but victim's mode of transport unknown	8 (0.09)
		V89.2	Persons injured in unspecified motor-vehicle	327 (3.57)
		V89.9	Persons injured in an unspecified vehicle accident	68 (0.74)
V90-V94 (water TA)	2(0.02)	V93	Accident on board watercraft without accident to watercraft	2 (0.02)
V98-V99 (other and unspecified TA)	208 (2.27)	V98	Other specified TAs	1 (0.01)
		V99	Unspecified TA	207(2.26)
Total	9162(100)			9162(100)

motorcycle (22.03%), cars (11.61%), and pedestrians (17.93%) were injured in collision with a car, pick-up truck or van. Most TAs occurred in summer (33.2%) and spring (26%).As shown in Figure-1, most of the accidents occurred between 6 PM to 8 PM, and fewer accidents occurred in the early hours of the day.

Discussion

In the present study, the majority of the people involved in TAs were men. Most TAs included motorcycle riders, car occupants and pedestrians, respectively. Most of the accidents occurred in summer and spring. World Health Organization report in which motorcycle was considered as a common cause of road traffic injuries and mortality around the world that is consistent with our findings (1). The type of vehicle and accident location are important factors that are significantly related to the severity of an accident (12). Previous studies showed that the highest accident trauma is related to motorcycle accidents (13, 14). Unlike the current study, in a study conducted in Fars province in Iran, car accidents were the most traffic accidents (15). Yau et al. stated that motorcyclists are at higher risk of severity of injuries rather than occupants of cars because motorcycles are less stable and larger vehicles may cause their unbalancing. Also, motorcyclists move more quickly than average (16). Motorcycles, with its small size, have more mobility, especially in crowded places (17) and so, in crowded cities like Mashhad with 3,312,090 inhabitants, they are used extensively. This is a reason that motorcycles are less secure than other vehicles. This makes them more vulnerable, and motorcycles manufacturing companies should concentrate on motorcyclists' safety. As shown in the present study, motorcyclists' mortality is high, which is consistent with the study of Spoerri et al. (18). In our study, men

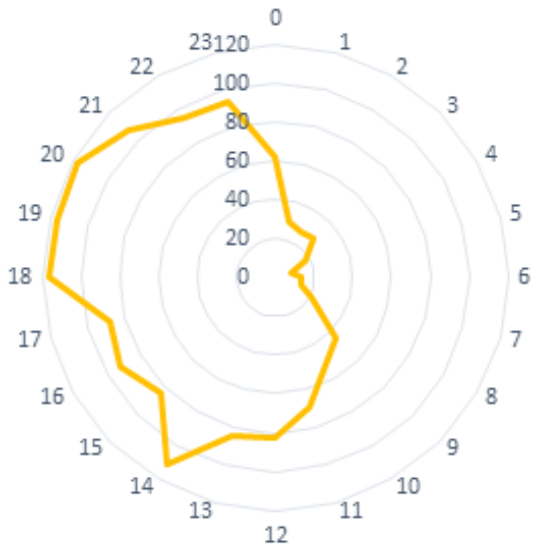

Figure1. Radar chart of the number of TAs in 24-hour day.

constituted the majority of TAs victims, which is consistent with previous studies in this field (15). Female drivers (25.78%) are much less likely to have a severe crash than male drivers (42.18%). Also, because driving behaviors are habits that are shaped by living standards and social culture, naturally, they are related to personal characteristics such as gender, age, educational level, and driver income (9). Sabey and Taylor stated that the driver characteristics were responsible for 95% of the causes that lead to an accident (19). Male drivers usually have an increased likelihood of traffic violations and therefore have a higher risk of being involved in fatal TAs (9).Another study revealed that driving speed is negatively related to the driver age and male drivers likely drive faster than female drivers (20). These accidents markedly are high among young people, and it seems that lack of experience of driving in young people, unauthorized speed and the tendency of high-speed driving can be causes of the driving accidents (21). Male drivers and drivers with less six years of working experience tend to violate traffic laws more (9). The type of vehicle, its security and whether the vehicle is commercially significant are associated with traffic violations (9).So, officials should consider more severe rigors regarding issuing motorcyclists driving licenses. According to a report on road safety in 2009, more than 1.2 million people annually died on the roads accidents and between 20 and 50 million people suffer from non-fatal injuries (22). More than 90% of deaths worldwide occur on the roads of low- and middle-income countries (23).It seems in countries with low income, mostly inexpensive vehicles such as motorcycles with low security were used that leads to dangerous accidents on the road. In the present study, most accidents occurred in summer and spring, respectively. Official holidays in Iran are in these seasons, and many travels occurred during these seasons. Since Mashhad is a holy and religious city, many passengers and tourists visit it, making the population of the city in these seasons to be three times of the real population; it seems that these factors cause more accidents in these seasons (24).In contrast with our results, Zhang et al. found that in autumn in comparison with spring and summer, the increased risk of accidents leads to fatal injuries. Environmental factors and other factors such as street lighting, weather conditions, the field of view and weekends are significantly related to traffic violations. In particular, the lack of street lighting, the inappropriate field of view, weekend, and rush hours (i.e., 7-8:59 and 17-19:59), offer the highest risk of traffic offenses (9). Yakovlev and Inden determined traffic deaths in 48 states of the United States from 1982 to 2006 and concluded that climate indicators, such as temperature and storm with hail are the most critical factors in determining traffic safety (25).In our study, most accidents occurred near sunset and early night, which seems the onset of darkness is effective in accident's occur-

rence. Nævestad et al. found that on weekdays, deadly bus accidents occur in the early morning and near late afternoon. Also, out-of-control accidents often occur during the evening and night (26). The crash time in these studies corresponds with the present study. Valent et al. found that the time of the day and whether the accident occurred on the weekend is significant in determining the severity of accidents (27). Public transportation has fewer risks of collision (28). In summary, Moeinaddini et al. showed that the business trips undertaken by public transport vehicles are negatively related to the deaths caused by road accidents, so that cities, where most of their business trips are done with public transport, have fewer deaths (29). This study was not without limitations. It was conducted as a retrospective study–reviewing hospitalized patients' records– that included some variables limitations and on the one hand, the fourth digit of external causes codes was mostly reported unspecified. Therefore, reporting more detailed information was not possible. Although coding the external causes in the studied hospitals by skilled coders was done, lack of checking the quality of the coding process can be considered as another limitation.

Conclusion

It is recommended that urban managers modernized the public transport fleet and planed for public education. They should plan to create a culture of using public vehicles. Policymakers should pay more attention to high-risk groups such as pedestrians and motorcyclists.

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Conflict of Interest

Authors declare that they have no conflict of interest.

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