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An Epidemiological Study of Road Traffic Accidents in Guilan Province, Northern Iran in 2012

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ABSTRACT

Objective: To determine the epidemiological characteristics of the road traffic injuries (RTIs) in Guilan province, northern Iran.
Methods: This study was a cross-sectional study which included all of RTIs admitted to medical centers of Guilan province (northern Iran) during 2012. ICD-10 was used as diagnostic criteria. Demographic variables also injury circumstance and in hospital variables such as length of stay, time of admission, type of surgery, ICU admission, final outcome and mechanism of injury, anatomical part of injury according to Abbreviated Injury Scale (AIS) classification were derives from records by trained research team. Descriptive data is reported. The predictors of mortality were also determined.
Results: The prevalence of road traffic injuries in Guilan province was 31 in 10,000 populations. Of total 7671 accidents, 5976 (77.9%) were men and 1695 (22.1%) were women. Mean age of these victims was 33.3±17.289 years (32.64±16.939 for men, 35.62±18.312 for women). Most of them (32.5%) were 20-29 years old. Motorcycle-car accidents had the highest frequency followed by car-car crashes and car accidents involving pedestrians. Most of the patients (85.9%) were hospitalized and 280 injured died (3.7%). Upper extremities were the most sites of injuries. Male sex, length of hospital stay, multiple injuries and increased age were associated with road traffic accident associated mortality.
Conclusion: RTIs cause enormous death and disability in this area and more road traffic preventive programs should be enforcement in these areas to reduce incidences RTI.

Keywords: Road traffic injuries (RTIs); Trauma; Epidemiology; Iran.

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Introduction

Road traffic injuries (RTIs) are one of the leading causes of premature death and disability worldwide [1] and estimated to be the eighth leading cause of death globally, with an impact similar to that caused by many communicable diseases [2]. More than 85% of the global deaths and injuries from RTI occur in developing countries [3]. They are the leading cause of death for young people aged 15–29 years, and as a result take a heavy toll on those entering their most productive years [2]. RTI will be one of the main causes of disability-adjusted life expectancy in 2030 [4]. It is estimated that by 2020 RTIs will have moved from ninth to third in the world disease burden ranking, as measured in disability adjusted life years [5]. Despite the fact, Road traffic injuries have not always been considered a preventable health problem [1].Guilan province is located in northern Iran, bordering the Caspian Sea, with a population of approximately 2.4 million residents and an area of 14,700 sq. km and is among the first three provinces with high rate of road accidents [6]. The aim of this study was to determine epidemiological characteristics of the RTIs in Guilan province in 2012.

Materials and Methods

Study Population

This was a cross-sectional study that was conducted in 2014 using Health Information Systems (HIS) of all medical centers, official documents of Emergency Medical Services (EMS) in Guilan. All records of injured patients due to road traffic accidents were entered in this study. The diagnostic criterion was ICD-10. Demographic variables such as age, gender, injury circumstance and in-hospital variables such as length of stay, time of admission, type of surgery, ICU admission, final outcome and mechanism of injury, anatomical part of injury according to Abbreviated Injury Scale (AIS) classification were derives from records by trained research team. The research protocol was approved by the institutional review board (IRB) and the medical ethics committee of Guilan University of Medical Sciences. As this was a retrospective study, no informed written consents were required.

Statistical Analysis

All the data were analyzed using statistical package for social sciences (SPSS Inc., Chicago, Illinois, USA) version 20. Descriptive statistics for the prevalence of events and quantitative variables were used and differences between demographic and injuries situation were calculated by t-test and chi square test. Effective factors in hospital mortality rate were determined using logistic regression. A 2-sided p-value of less than 0.05 was considered statistically significant.

Results

Seven thousand six hundred seventy-one victims were admitted due to road traffic injuries during study period that was estimated as 34 per 10,000 inhabitants in Guilan. Fooman, Roodbar, Astaneh-Ashrafiecities reported 63, 62 and 48 per 10,000 populations, respectively. Overall, 5976 victims (77.9%) were men and 1695 injured patients (22.1%) were women. Mean age of the victims was 33.3±17.29 years (32.64±16.939 for men, 35.62±18.312 for women; p=0.068). Most of the victims (32.5%) were 20-29 years old. A difference was observed in different age groups in terms of accident time ($p\leq0.001$). Almost all accidents were occurred in urban area during night time (Table 1). Table 2 represents mechanism of accidents in terms of vehicle type along with adapted codes (ICD-10) which shows that motorcycle-car accidents had the highest frequency followed by car-car crashes and car accidents involving pedestrians. Type of vehicle was significantly different in different groups based on age and sex [$p\leq0.001$]. Most victims were transferred to hospital (44.7%) by EMS and ambulance (44.4%). Other transferred vehicles were taxi and personal cars.

Table 1. Demographic and road traffic injuries associated characteristics in 7671 patients admitted to medical centers of Guilan province during 2012.

Variable	Frequency
Age	33.3±17.29
Sex	
Men (%)	5976 (77.9%)
Women (%)	1695 (22.1%)
Place of accident	
Urban (%)	3859 (50.3%)
Rural (%)	3176 (41.4%)
Suburb (%)	636 (8.3%)
Time of accident	
Morning (%)	1148 (14.9%)
Noon (%)	1477 (19.4)
Evening (%)	1807 (23.5%)
Night (%)	3239 (42.2%)

Treatment status and final outcome in hospital are presented in (Table 3) in which 85.9% of patients were hospitalized. Men and age group 20-29 year was among the higher hospitalization groups. In-hospital mortality rate was 3.7% (n=280). The highest rate of mortality was in 20-29 years age group, as well as by type of vehicle accident belonged to car-pedestrian accident, 90 (6.6%) of pedestrians died .Anatomical affected regions were showed based on ICD-10 codes in Table 4. Upper extremities had the highest injuries followed by head and neck and lower limbs. Most of victims had multiple traumas. Median percentile (25-75) of length of stay in hospital was 1 day (1-4 days). Results by using logistic regression revealed that male sex, length of stay in hospital, multiple injuries and increased age are predictors of in-hospital mortality rate (Table 5).

Table 2. Mechanism of accidents in terms of vehicle type along with adapted codes (ICD-10) in 7671 victims in Guilan province during 2012.

Vehicle	ICD-10 code	Frequency (%)
Car- motorcycle	V50	2426 (31.6%)
Reversal motorcycle	V20	733 (9.6%)
Car- animals	V50- V60	21 (0.3%)
Car- bicycle	V20	82 (1.1%)
Care- Pedestrian	V03.1-V04.1	1362 (17.8%)
Motorcycle- bicycle	V20	17 (0.2%)
Motorcycle- Pedestrian	V01.1	314 (4.1%)
Bicycle- Pedestrian	V02.1	6 (0.1%)
Motorcycle-motorcycle	V20	305 (4%)
Reversal car	V50-V60-V70	813 (10.6%)
Car-car	V50-V60-V70	1592 (20.8%)
		7671 (100%)

Table 3. Outcome of 7671 victims of road traffic accidents admitted to medical centers of Guilan province during 2012.

Variable		Frequency (%)
Hospitalization	Yes	6590 (85.9%)
	No	1081 (14.1%)
Outcome	Recovery	1054 (13.7%)
	Recovery with complications	5765 (75.2%)
	Voluntarily discharge	562 (7.3%)
	Dead	280 (3.7%)
	Refer to other hospitals	10 (0.1%)

Table 4. Anatomical regions of injuries in 7671 victims of road traffic accidents admitted to medical centers of Guilan province during 2012.

Variable	ICD-10 code	Frequency (%)
Upper extremities	S00-S10 S20-S30	2630 (34.3%)
Lower extremities	S80-S90	1801 (23.5%)
Head and neck	S00-S10	2026 (26.4%)
Abdomen & Pelvic	S70	411 (5.4%)
Vertebral Column	S30	248 (3.2%)
Face	S00	492 (6.4%)
Without injury	-	63 (0.8%)
		7671 (100%)

Table 5. Predictors of road traffic injuries associated mortality in 7671 patients admitted to Guilan province medical centers during 2012.

Variable	N	OR (95%CI)	*p* value
Sex			
Male	5928	1.81 (1.28-2.54)	≤0.001
Female	1680	1	
Length of stay in hospital	6590	1.02 (1.00-1.04)	≤0.02
Multiple injuries	7608	1.2 (1.04-1.38)	≤0.01
Age			
1-9	331	0.31 (0.16-0.59)	≤0.001
10-19	1188	0.18 (0.1-0.3)	≤0.001
20-29	2469	0.22 (0.14-0.34)	≤0.001
30-39	1277	0.19 (0.11-0.32)	≤0.001
40-49	898	0.29 (0.18-0.48)	≤0.001
50-59	696	0.42 (0.26-0.68)	≤0.001
60-69	421	0.74 (0.46-1.19)	≤0.2
≥70	362	1	

Discussion

This study aimed to determine epidemiological characteristics of the road traffic injuries in Guilin province, northern Iran. The prevalence of traffic accidents in 2012 was 31 for each 10000 people who was compatible with that of Heydari *et al*. study [7] and was higher than a study performed in Tehran [8] and Latin America [9]. This area of study has many travelers especially in high seasons therefore higher rate of RTIs was predictable. RTIS rate was calculated based on the population of the same year in Guilan.

77% of the total number of victims was men who are compatible with prior research in Iran as well as other countries [10-14]. Furthermore, sex mortality ratio in traffic accidents was 5.2:1 which was higher than Fars province of Iran [15]. Yet a study in Vietnam [16] showed that this ratio was lower. Mean age of traffic accident injured was lower than that of Pakistan [17] and Italy [18]. Results expressed that mean age of men and women compared to Soori *et al*., [19] study was less for men and more for women.

Regarding different age groups, the most and least traffic accidents belonged to 20-29 years old group and less than 10 years. The most traffic accident occurred for men between 20-29 years of age and for women in range of 30-39years. As other studies, young people were the most victims of road accidents [12-19]. In this study, 56.4% traffic accidents happen in married persons that were incompatible with other studies [8,15].

Most accidents [50.3%] occurred in urban and suburb areas followed by rural areas [41.4%] similar to Pakistan [17]. This was different from the study in Fars [15] where most accidents were in rural areas. Regarding the 2000 hot spots signified in Iran, based on a report from Ministry of Health, Guilan province is also considered as a hot spot [20]. In urban areas, car crash, car-pedestrian accidents were the most prevalent type of crashes. In rural regions, car-motorcycle accident was the most common followed by car-car crash. Our results were similar to those of Fars study [15] .However, a study in Egypt reported pedestrian to car accident as the most common incidence [21].

This study found that most accidents occurred at night [42.4%] followed by evenings which was different from other study in Iran [7,14]. Findings showed an increasing pattern from morning to night which reaches the peak at last hours of day. In terms of vehicle types involved during 24 hrs, car-car crash, motorcycle-car, car-pedestrian occurring at night had the highest frequency. Bicycle-pedestrian and motorcycle-pedestrian accidents occurred mostly in the evening. Most frequently, incidents occurred in the morning [24.4%] with high rate of car-bicycle accident.

According finding our study [31.6%] of accidents belonged to car-motorcycle accident [the most frequent]. After that, car-car crash was the cause of 20.8% of accidents followed by car-pedestrian accident [17.8%]. Yet, this contradicts the study in Tehran [8] where most accidents dedicated to motorcycle-pedestrian accident. A study in Kenya [22] showed that the highest rate of accidents involved car and motorcycles, compatible with our finding, still different from a research performed in Egypt [12] where pedestrians have more accidents. In different age groups, the highest rate of accidents belonged to car-motor accident but in age range of 1-9 years old, pedestrian were most victims of car accidents which were similar to a study in Belgium by Dhondt *et al*., [23]. Men were most victims of car-motorcycle accident [22,24] followed by car-car [10,11] and car-pedestrian. On the other side, women were mostly involved in car-car [5,8] and car-pedestrian accidents [3], respectively.

EMS 115 and hospital ambulance were the transfer vehicles .According to a study in Cameron [24]; most victims of accident were transferred to medical centers by personal cars compatible with a study in Iran [25]. 89.5% of them were hospitalized and 10.5% were outpatient that the number of hospitalizations was two times more than a study in Tehran [26]. Hospitalization was higher in men than women insisting that the severity of injuries were higher in the former. 10-39 years of age was the most age for hospitalization and in 20-29 years of age group, 85% of the victims were hospitalized. Injuries caused by car and motorcycles increase the risk of hospitalization which can be due to higher severity and lesser use of safety equipment.

Upper extremities injuries and upper body parts was the most important causes of hospitalizations, following head and neck and lower extremities. In men, 34.1% of injuries were in upper extremities whereas in women, head and neck were the most injured body organs [27.8%].In different ages, upper extremities and head and neck were the most injured parts which were different from Belgium [23] and Shiraz study [13] with head and neck prominence. In Mexico [12], surface injuries had the highest frequency.

According to findings, 280 patients died (3.7% of all injured) that of them 235 death was in men (83.9%) and 45 death in women (16.1%).This rate was higher than mortality rate in Modarres study [14] that included all those patients who were transferred to center of trauma and injuries and passed away during the hospital stay. Accidents are responsible for 10% of death in the world, even higher than that of AIDS, Malaria, and Tuberculosis [27]. Moreover, in 2020, traffic accidents will have the sixth cause of death and in terms of DALY and burden of disease will rank second [25]. The highest rate of mortality was in 20-29 years old age group. From these 280 injured, 90 (32.1%) were pedestrians. This finding is in contrast with studies by Lankarani et al. in Shiraz [15] and Thailand [11] in which car passengers and motorcyclist were

the most common type of victims. However, in Egypt [12] and Latin America [9], the highest death rate belonged to pedestrians. Average duration of hospitalization was 2.8 days (from 1 to 68 days). The length of hospital stay was less than other studies [9,26-29]. There was no difference among men and women in term of number of injuries. The final outcome of death, according to the logistic regression model showed that gender, length of stay in hospital, number of injuries and age groups have significant impact on death.

In conclusion, traffic accidents a major health issue with a high rate of mortality and morbidity is Guilan province. It seems that due to decreasing trend of death rate in the province, more integration among involved departments, efficient interventions and performing research as well as taking preventive measures are essential for reducing the burden of this problem on individuals and society. High rate of accidents in Iran shows that there is a significant difference between men and women in terms of geographical site of incidence. Most traffic accidents occurred for men in urban and suburban areas. Vehicles involved in accidents were significantly different in various regions.

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