A Survey of Non-Fatal Road Traffic Accidents in Babol, Northern Iran

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Abstract

Background: Every year, millions of people die or are injured due to road traffic accidents worldwide. Investigating the epidemiology of these accidents could help reduce their frequency.

Objectives: This study aimed to evaluate the epidemiological characteristics of non-fatal traffic accidents in Babol, northern Iran, over a seven-year period.

Methods: Between 2010 and 2016, all of the orthopedic patients with road traffic accidents hospitalized at Shahid Beheshti hospital of Babol were enrolled in this cross-sectional study. The patients' information, including details of the accidents and demographic characteristics, was collected using predesigned checklists.

Results: The majority of 3649 subjects (2748, 75.3%) were male. The age range was from 1 to 86 years old, with an average of 30.5 ± 15.4 years. Traffic accidents were mostly seen in the age group of 19 - 40 years (58.7%) and in those who were drivers (52.7%). The accidents were highest in 2016 (19.9%), and on interurban roads (32.9%), on sunny days (73.4%), asphalt roads (74.3%), and in the morning (42.8%). November (12.7%) was associated with the highest monthly rate, followed by August (11.9%) and March (11.2%). Fractures were observed mostly in the leg (n = 960), followed by the forearm (n = 773).

Conclusions: The results showed that road traffic accidents have increased in recent years. It is recommended to improve the traffic safety with the improvement of the geometric design of the roads, especially in roads with a high probability of accident risk.

Keywords: Traffic, Accidents, Epidemiology

1. Background

Traffic accidents are one of the most important causes of death in the world. According to the statistics of the world health organization (WHO), traffic accidents were responsible for 1.25 million deaths along with millions of injuries all over the world in 2013 (1). In addition, they are presently reported to be the ninth most common cause of death in the world, irrespective of age, and are expected to reach the seventh rank by 2030 (1). Road traffic accidents and their outcomes are more notable in developing countries, especially in Iran, compared to developed countries (2). According to a national health survey in 2005, Iran had the highest rate of deaths due to road traffic accidents worldwide, with an annual rate of 30,721 (44 per 100,000 population) (3). In addition, a study conducted between March 2010 and June 2010 reported 538,588 road traffic accidents in Iran (4). Therefore, understanding the factors leading to road accidents is an important public health issue in Iran.

A number of factors related to driver, environment, and vehicles are involved in the road traffic accidents. Previously published data from Iran alluded to some factors, for example, the increasing use of private transportation vehicles instead of public vehicles, low gas price, and especially the use of cars and motorcycles with inadequate safety equipment (5). Additionally, the role of adverse weather conditions, that is rainy or snowy, cold or hot, cloudy or sunny weather, and slippery road surfaces is important. Several studies have been performed on the relationship between weather and traffic accidents, showing that adverse weather conditions increase the risk of road accidents and the related fatalities (6-8). This issue has also been assessed by Iranian researchers. For instance, a study in Ahvaz, southeastern Iran, indicated that high average temperatures and an increase in the number of rainy and

frosty days were associated with an increased number of road accidents (9). In addition to the weather, the role of time as an environmental factor is undeniable in the occurrence of traffic accidents. Generally, it is believed that the traffic accidents are seen more frequently in the night than in the daytime, mostly due to the tiredness of the drivers and reduced vision.

2. Objectives

We aimed to investigate the epidemiologic patterns of road traffic accidents in Babol, Northern Iran, over a seven-year period. These data could be helpful in improving the planning of measures to reduce the number of deaths from road traffic accidents.

3. Methods

This cross-sectional study was performed from 2010 to 2016. All orthopedic trauma patients, who were hospitalized in Shahid Beheshti teaching hospital of Babol due to trauma from road traffic accidents, were included in this survey. This government hospital is one of the active trauma centers in Mazandaran province. Subjects with unclear information on the weather condition at the time of the accident were excluded.

A checklist was designed to collect every patient's information. The checklist contained the following items:

1) Details of the accident, including year, month, time (morning [7:00 - 13:30], afternoon [13:31 - 19:00], and night [19:01 - 6:59]), place (urban, interurban, urban-rural, rural, inter-rural), road type (asphalt, dirt), season, weather condition (cloudy, rainy, sunny), and anatomic site of trauma.

2) Demographic information, including age, gender, marital status, residency, and the patient's role at the time of the accident (driver, passenger, pedestrian or pillion). The data were recorded every day and obtained from the patients or their companions and by reading their records. The information on weather conditions at the time of the accident was confirmed by the meteorological organization of Mazandaran province.

The informed consent was obtained from all subjects. This research was approved by the research ethics committee of Babol University of Medical Sciences (code: MUBABOL.REC.1391.11). Finally, the obtained data underwent descriptive analysis using SPSS software.

4. Results

A total of 3649 patients were enrolled in this survey, of whom 2748 (75.3%) were male and 901 (24.7%) were female.

The average age was 30.5 ± 15.4 years old, ranging from 1 to 86 years. Age distribution of the patients is shown in Figure 1. About 66.4% (n = 2423) were married and the remainder was single. The majority, 65.1% (n = 2375), had rural residency, and the remainder lived in a city. Most of the patients (52.7%, n = 1923) were drivers and the fewest (8.3%, n = 303) were passengers (Figure 2).
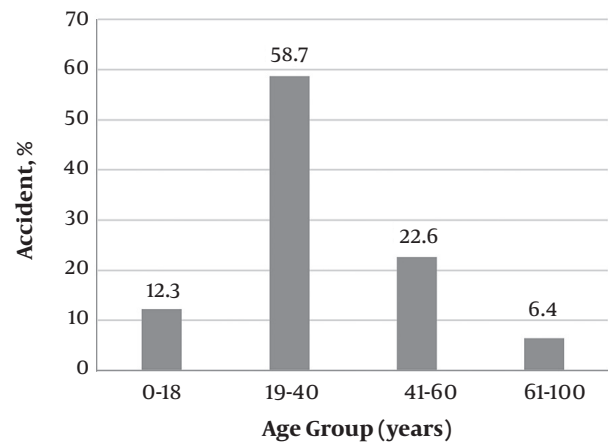

Figure 1. Age distribution of patients with a road traffic accident in Babol, Northern Iran, 2010 - 16
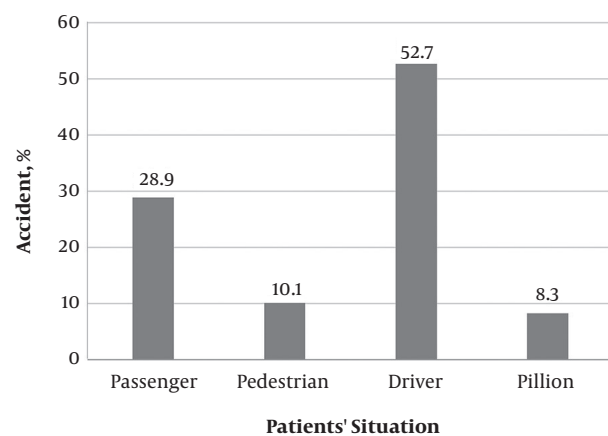

Figure 2. Patient's situation at the time of road traffic accident in Babol, Northern Iran, 2010 - 16

As exhibited in Table 1, the sunny days had the most frequency of traffic accidents (73.4%), compared to the rainy days, which had the least frequency (12.1%). In addition, most of the accidents occurred on interurban roads (32.9%) and the fewest were on rural roads (5.2%). Accidents mostly occurred on asphalt roads (74.3%). Accidents were mostly seen in the morning (42.8%), followed by in the afternoon

(31.6%) and in the night (25.6%).

Variables	Frequency of Accidents	Percent of Accidents
Weather conditions		
Sunny	2678	73.4
Cloudy	529	14.5
Rainy	442	12.1
Place of accident		
Urban	1131	31
Rural	190	5.2
Interurban	1201	32.9
Inter-rural	533	14.6
Urban-rural	595	16.3
Road type		
Asphalt road	2711	74.3
Dirt road	938	25.7
Time		
Morning [7:00 - 13:30]	1562	42.8
Afternoon [13:31 - 19:00]	1153	31.6
Night [19:01 - 6:59]	934	25.6

With respect to the timing of accidents, the year 2016 had the highest annual accident rate (19.9%) (Figure 3), and November (12.7%), August (11.9%), and March (11.2%) were associated with the highest monthly rates, in sequence (Figure 4).
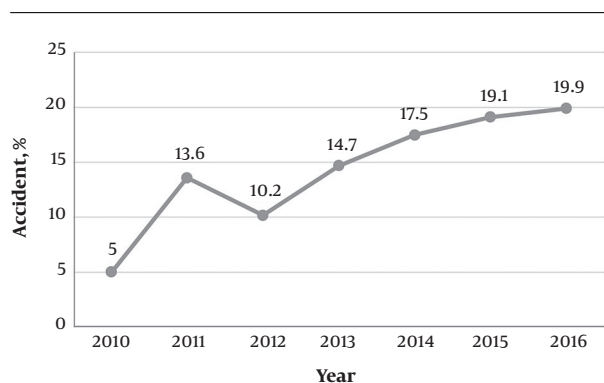
Figure 3. Time trend of road traffic accident rates in Babol, Northern Iran, 2010 - 16

The majority of the patients (75.3%) had a single injury, but 24.7% experienced multiple traumas. Fracture

was seen in the following sites: left clavicle (n = 68), right clavicle (n = 45), left humerus (n = 251), right humerus (n = 218), left forearm (n = 377), right forearm (n = 396), left hand (n = 244), right hand (n = 276), left femur (n = 315), right femur (n = 388), left leg (n = 467), right leg (n = 493), left foot (151), right foot (n = 162), patella (n = 25), and pelvis (n = 77).

5. Discussion

This study showed a rising trend in the number of road traffic accidents in Babol over the seven years and the year 2016 was associated with the highest number of traffic accidents. A recent review article reported that the road traffic accidents in Iran showed a rising trend between 1997 and 2006, that is, the frequency of accidents increased fourfold from n = 160,284 to n = 642,656 (10). In addition, the fatality rate doubled during these 10 years. However, the fatality rate decreased from 2006 to 2012, and the number of injuries increased from n = 88,000 to n = 320,000 during 1994 - 2012 (10). One of the important reasons for the high rate of accidents and the related fatalities can be attributed to the lack of a traffic safety improvement program and an increased number of vehicles on the roads (10, 11).

The present study demonstrates that road traffic accidents were more frequent in males than in females, with a ratio of 3.05. Previous articles were in agreement with our results. In a report from Tabriz, north-west Iran, 67.4% of the patients were male (12). In addition, a national survey revealed that the incidence of road traffic accidents was about ten times more in Iranian males than in females (13). A higher rate of accidents in men is to be expected due to the types of work performed by males compared to females and due to some cultural restrictions for females in the use of vehicles.

Most of the injured patients in this study were in the age range of 19 - 40 years old. Likewise, previously published papers in Iran and other countries show that road traffic accidents are usually recorded more in younger subjects than in older ones. It seems that the increased risk of accidents in this age group is due to the need for travel to perform a living or education in young people, their little experience of driving, unnecessary acceleration, and finally inadequate knowledge of traffic rules and regulations (14-16).

The frequency of traffic accidents was higher on sunny days in our survey. Previous reports are in accordance with our findings (17, 18). Of course, some are not comparable and show an inverse relationship between clear weather conditions and road accidents (9). Altogether, the increase in road traffic for traveling out of the town, the higher speed of drivers, and their carelessness on sunny
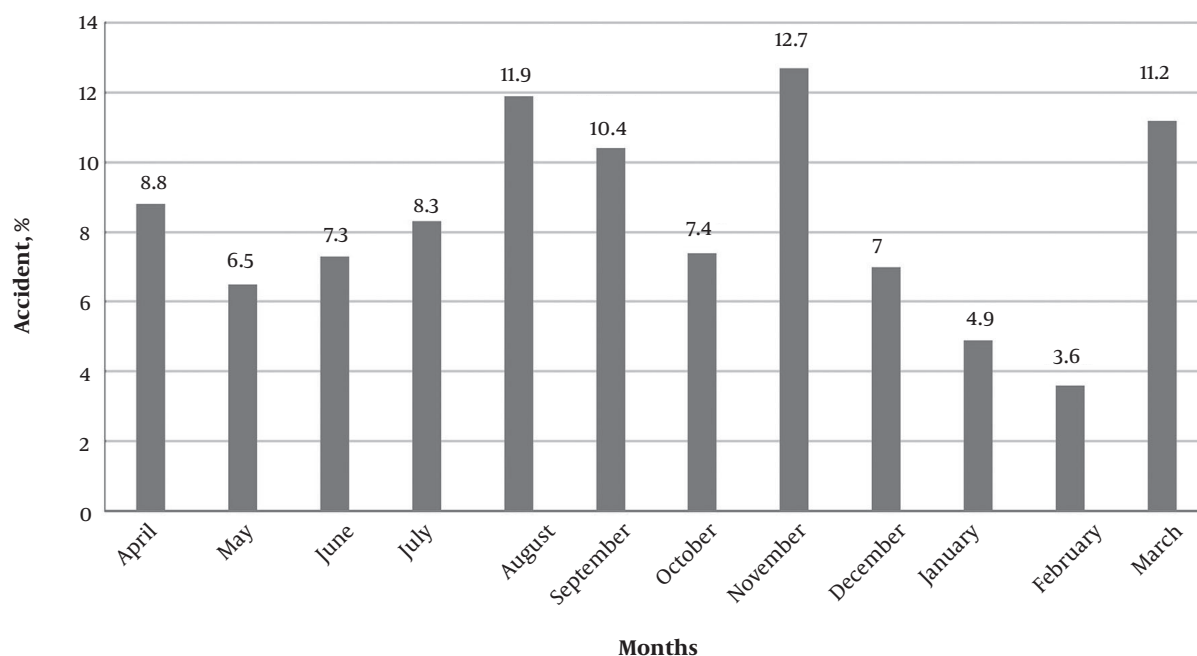
Figure 4. Frequency of road traffic accidents in Babol, Northern Iran, 2010 - 16, according to the months

days could explain the high rate of crashes. The clear and sunny climate of Iran could also increase this risk.

Concerning the time of traffic crashes, we witnessed higher rates in the first half of the year (especially summer season) than in the second half. One of the causes could be the summer vacations and Nowruz holidays when the volume of traffic is high. In addition, most of the accidents took place in the morning; this could be due to a range of issues, such as drowsy driving, peak work times, and higher traffic volume compared to the rest of the day.

As indicated, fractures were seen more in the lower limbs than in the upper limbs. This is in agreement with some previous results (19, 20). A study in Kashan similarly showed that leg had the most frequent fractures (37.6%), followed by forearm (19.3%) (21). Overall, the fracture incidence can vary between different regions worldwide, based on geography, ethnicity, and socioeconomic status (22-24).

According to our results, the rate of traffic accidents has increased in Babol during recent years. It is suggested that a study is designed to widely investigate the pattern of the road traffic accidents combining with weather and traffic conditions in risky paths. Additionally, the ratio of accidents to traffic rate should be evaluated. In order to reduce human fatalities, geometric correction of the roads with high accident probabilities, and construction of new roads in compliance with international standards are also recommended. For a better coordination between the organizations, it is proposed that the trauma centers be established at least in all of the universities of the country.

Acknowledgments

Footnotes

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