Causes of Road Accidents in Northwestern Iran in the Period 2010–2018

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Abstract

Aims: Traffic accidents are one of the major causes of death and disability worldwide. The aim of this study was to determine the causes of road accidents in northwestern Iran in the period of 2010–2018. **Materials and Methods:** This cross-sectional study was performed on all road traffic accidents recorded by traffic police of West Azerbaijan Province during 2010–2018. Data were analyzed using descriptive statistics, Chi-square t-test, and time series by SPSS 16. **Results:** A total of 95,788 registered accidents were included in the study. Most of the accidents were in September with the frequency of 9960 cases (10.4%), in residential, office, and industrial regions 58,550 (56%), by cars and taxi 80,949 (66%), in collisions between a vehicle with a bicycle and a motorcycle 56,728 (58%), in front-to-rear and right-side crashes 49,714 (47%), in rural and main roads 59,855 (62%), in clean weather 73,887 (73%), and on Thursday 14891 (15%); the occurrence of traffic accidents showed a significant relationship with all of these variables ($P = 0.001$). **Conclusions:** Month of accident, type of accident, day of the week, location of accident, use of vehicle, type of collision, mode of collision, accident path, and weather were the effective factors contributing in the occurrence of the traffic accidents. It is suggested that, in addition to educating people regarding the prevention of traffic accidents, policymakers take steps to improve the safety and standardization of roads and increase the safety of vehicles.

Keywords: Accidents, effective factors, Iran

INTRODUCTION

Although human scientific development in recent decades has brought industrial development and the enjoyment of relative prosperity, it has brought about a new problem of traffic accidents.[1] Road traffic accidents are the most important causes of accidents and death in the world;[2] they are considered to be the major causes of disability after cardiovascular disease and cancer. Accidents, no difference in type and extent, impose many economic and social problems on society and may also add to existing bottlenecks.[3,4] At present, accidents are one of the problems of the medical community that can cause irreversible injuries, may impose heavy costs, and can cause power depreciation of various forces such as police force, judicial authorities, and medical and forensic centers.[5]

In recent years, the increased rate of deaths and injuries due to traffic accidents is one of the most important health problems

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and also one of the most important causes of disability and injury;[6,7] in other words, road traffic accidents kill 1.24 million people worldwide annually. If appropriate actions have not been taken, that number will be increased to 1.9 million by 2020. This value varies across regions of the world. In Iran, the reported number is 23,249. Iran has one of the highest death rates of road accidents in the world (34.1 per 100,000).[8] Furthermore, Iran has the highest death rate and disease burden from road accidents compared to other countries. Traffic accidents in Iran, with 26.7% of the total number of deaths, are the second leading cause of death and the first cause of death in the country. That is, the rate is the highest in the world and the eastern Mediterranean region.[9,10] On the other hand, the main victims of these accidents are young people between the ages of 15 and 29. In addition, low- and middle-income countries are the most vulnerable to traffic accidents where more than 90% of road accidents leading to death occur in these countries, despite the fact that only 40% of vehicles are from low-income countries.[11,12] The importance of traffic accidents compared to other hazards and dangers to human health is quite evident; if we want to talk about the causes and factors influencing the occurrence of these accidents, we should consider all aspects related to them because road accidents are a multifactorial phenomenon. In the occurrence of accidents, several factors with different contributions are involved. In each accident, the contribution of human factors, road (road and street), and vehicle is different.

Results of several studies have shown that the number of factors affecting traffic accidents exceeds 250 factors, but they can be divided into three general categories: environmental, technical, and human factors. Based on the available evidence, the impact of the first two factors in developed countries has diminished, and in contrast, the role of human factors has become more important.[13,14] Findings of some studies revealed that vehicle and human factors, such as sleepiness while driving,[15] gender, lack of using seat belt,[16] weekday, travel time, direction of travel,[17] age and speed while driving,[18] and being a smoker, have been identified as major risk factors for road accidents.[19] Several studies have been conducted to determine the relationship between different factors and the occurrence of the accidents and classified the factors affecting road accidents; human factors (behavioral ones) appear to be the main cause in 60% of the vehicle accidents and in 95% of all accidents.[20,21] As stated above, the seriousness of accidents and their casualties in Iran is recognized as a health problem that directly and indirectly affects the health system. On the other hand, controlling the incidence rate of traffic accidents in some countries indicates the potential for effective interventions to reduce the occurrence of traffic accidents. There are many factors that can contribute to traffic accidents. This study sought to take effective steps in reducing and controlling this health problem by identifying each of the factors and providing documentation to relevant authorities. Therefore, the aim of the present study was to determine the pattern of accidents with an emphasis on the factors affecting their occurrence in West Azerbaijan Province during 2010–2018.

MATERIALS AND METHODS

This descriptive cross-sectional study was conducted on all road traffic accidents recorded by traffic police of West Azerbaijan Province during 2010–2018. The traffic police data of the accidents were collected using the census method. The traffic accident information and its causes were divided into three categories: traffic accidents leading to damage, injury, and death.

In fact, accidents leading to damage are the accidents that result in damage, injury-related accidents are accidents resulting in injuries, and fatal accidents are those resulting in death.[22] In order to collect information, a number of inclusion and exclusion criteria were determined. The inclusion criteria included accidents occurred in West Azerbaijan Province and registered by traffic police and exclusion criteria included nontraffic accidents and traffic accidents that their data had not been recorded or not completely recorded. Moreover, the random people were those who had an accident in West Azerbaijan Province and were injured or killed.

Finally, with the guidance of the city and provincial head police and the head of traffic Police office of applied research, and with the help of statistics experts of road police, the registered data of traffic accidents occurred during 2010–2018 and classified based on the years, month, day of the week, accident location, vehicle use, type of collision, how the accident occurred, accident route, weather, and days of the week were obtained from the road police datasheets (COM 114), which are recorded in the road police information system. Because every accident, damage and injury that occurs, a sheet is filled for each accident and the information is completed and these sheets have the complete information of each accident and this information is registered in the Rahvar police system and we report we get this information on a monthly and annual basis.

The plan was also reviewed by the Rahvar traffic police research center. The source of information was the Rahvar police of West Azerbaijan Province. Data were collected after SPSS 16 (Microsoft Corporation also This software was created by Norman Ney in 1968 at Stanford University in the United States) and analyzed using descriptive statistics (frequency, percentage, and mean) and analytical statistics (Chi-square test, *t*-test, and time series). Furthermore, this research project was approved by the Ethics Committee of Urmia University of Medical Sciences with the Ethics Code of IR.UMSU. REC.1396.373.

RESULTS

According to the results of the present study, the highest number of traffic accidents leading to damage, injury, and death occurred in 2010, 7647 (16%), 2012, 6558 (14%), and 2011, 513 (17%), respectively [Table 1]. Furthermore, the highest number of accidents resulting in damage 4765 (10%), injuries 4863 (12%), and death 332 (12%) occurred in September and the lowest number occurred in May 3635 (7%), January 2715 (6%), and January 180 (5%), respectively.

The results of the present study showed that the lowest number of accidents resulting in damage, injury, and death occurred on Friday 6465 (13%), Tuesday 6292 (12%), and Tuesday 408 (13%). In addition, the lowest number of accidents based on accident location was in unspecified places in 2010, 300 (4%), administrative and industrial residential areas in 2013, 5668 (9%), recreational, agricultural, and educational areas in 2015, 859 (7%), and nonresidential areas in 2010, 1647 (7%). The lowest number of accidents leading to damage, injury, and death occurred in unspecified places [Table 2].

Regarding the vehicle type, most of the accidents were related to the crashing with unspecified vehicles in 2016, 1863 (21%), with light vehicles in 2012, 10,068 (12%), with semi-heavy vehicles in 2011, 2807 (14%), and with heavy vehicles in 2015, 1303 (12%), respectively. Furthermore, the highest number of accidents leading to damage, injury, and death was related to light vehicles [Table 3]. The most frequent types of collision were related to the collision with unspecified vehicle in 2016, 1905 (34%), collision of vehicle with bicycle and motorcycle

in 2012 with the rate of 8100 (15%) cases, pedestrian and animal collision and overturning in 2010, 2907 (16%), and motorcycle collision with pedestrian and off-road in 2012, 2397 (13%). Furthermore, the highest number of accidents leading to damage, injury, and death occurred as a result of the collision of a vehicle with a bicycle or a motorcycle [Table 4].

The results showed that the lowest number of accidents by the type of collision was related to the unspecified collisions in 2014, 89 (1%), the front to back and right side in 2016, 4247 (8%), back to right-side and side-by-side collision in 2015, 296 (4%), and the other causes in 2014, 2697 (7%), respectively. On the other hand, the less frequent accidents with damage, injury, and death occurred in unspecified collusions. Moreover, most of the accidents regarding the location of accident occurred on unspecified roads in 2016, 99 (20%), on the freeway, main road, and subroad in 2012, 4133 (14%), main road and rural road in 2011, 7734 (13%), and avenue and alley in 2010, 2514 (46%), respectively. Most of the accidents resulting in damages and injuries occurred on the rural and main roads, and fatal accidents occurred on freeways, main roads, and subroads.

According to the results of the present study, most of the accidents occurred in unspecified weather condition in 2012, 3311 (17%), in clear weather in 2010, 9531 (13%), in foggy and rainy weather in 2010, 697 (18%), and cloudy and misty in 2010, 590 (18%), respectively. The results also indicated that most of the accidents resulting in damage, injury, and death happened in clear weather [Table 5]. Finally, there was a significant relationship between the year of occurrence of the accident and the type of accident, month of accident, accident time, accident location, type of vehicle, type of collision, mode of collision, road of the accident, and weather conditions ($P = 0.001$). The results also show that the overall death rate from accidents is declining.

Table 1: Distribution of traffic accidents in West Azerbaijan Province during 2010-2018

Year of accident	Type of accident, frequency (%)			*P*
	Damage	**Injury**	**Death**	
2010	7647 (16)	3557 (7)	292 (10)	0.001
2011	6185 (13)	5817 (13)	513 (17)	
2012	5729 (12)	6558 (14)	486 (16)	
2013	4781 (10)	6355 (14)	487 (16)	
2014	5152 (11)	4862 (11)	303 (9)	
2015	5251 (11)	4317 (10)	285 (9)	
2016	5751 (12)	4742 (10)	226 (7)	
2017	5957 (12)	4457 (10)	236 (7)	
2018	6050 (13)	4824 (11)	282 (9)	
Total	47,189 (50)	45,489 (48)	3110 (2)	

Table 2: Distribution of traffic accidents by location of the accident

Year	Frequency (%)				*P*
	Unspecified	**Residential, official, industrial**	**Recreational, agricultural, educational**	**Nonresidential, other places**	
2010	300 (4)	7885 (14)	1953 (16)	1647 (7)	0.001
2011	1312 (16)	7791 (14)	1683 (13)	2385 (9)	
2012	1377 (16)	7253 (13)	1650 (13)	3469 (14)	
2013	1366 (16)	5668 (9)	1192 (9)	3729 (16)	
2014	734 (9)	5778 (10)	1027 (10)	3208 (13)	
2015	670 (8)	6252 (11)	859 (7)	2919 (11)	
2016	1046 (12)	6114 (10)	1400 (12)	2437 (9)	
2017	984 (11)	5684 (9)	1168 (9)	2724 (10)	
2018	784 (8)	6125 (10)	1384 (11)	2894 (11)	
Location of accident					
Damage	1479 (17)	34,092 (58)	5728 (47)	11,598 (45)	0.001
Injury	6247 (72)	22,129 (38)	5778 (47)	12,238 (48)	
Death	847 (11)	2329 (4)	810 (6)	1576 (7)	
Total 104,851 (100)	8573 (8)	58,550 (56)	12,316 (12)	25,412 (4)	

Table 3: Distribution of traffic accidents by the type of vehicle

Year	Frequency (%)				P
	Unspecified	Lightweight vehicles	Heavy vehicles	Semi-heavy	
2010	680 (8)	9611 (12)	2761 (12)	1059 (9)	0.001
2011	1538 (18)	9883 (12)	2807 (14)	1217 (11)	
2012	1383 (16)	10,068 (12)	2685 (12)	1285 (12)	
2013	204 (2)	9980 (12)	2475 (11)	1260 (12)	
2014	322 (4)	8778 (11)	2417 (11)	1293 (12)	
2015	580 (7)	8127 (10)	2104 (10)	1303 (12)	
2016	1863 (21)	7732 (10)	2068 (9)	1204 (11)	
2017	840 (10)	7921 (10)	2241 (10)	1146 (10)	
2018	1280 (14)	8849 (11)	2452 (11)	1211 (11)	
Type of vehicle					
Damage	2807 (32)	40,736 (50)	15,616 (70)	4078 (37)	0.001
Injury	5486 (64)	36,357 (44)	5019 (22)	5821 (53)	
Death	397 (4)	3856 (6)	1375 (8)	1079 (10)	
Total 122,627 (100)	8690 (7)	80,949 (66)	22,010 (18)	10978 (9)	

Table 4: Distribution of traffic accidents by the type of collision between vehicles

Year	Frequency (%)				P
	Unspecified	Bicycle and motor vehicle collision	Vehicle with pedestrian and animal collision and overturn	Motor collision with pedestrian and off-road	
2010	221 (4)	7746 (14)	2907 (16)	656 (4)	0.001
2011	383 (7)	7668 (14)	2252 (11)	2188 (12)	
2012	169 (3)	8100 (15)	2592 (13)	2397 (13)	
2013	174 (3)	7085 (13)	2532 (13)	2120 (12)	
2014	80 (2)	6273 (10)	1959 (10)	1948 (11)	
2015	1789 (32)	4467 (8)	1711 (9)	1879 (11)	
2016	1905 (34)	5151 (9)	1566 (8)	1983 (11)	
2017	484 (8)	4894 (8)	1910 (10)	2120 (12)	
2018	392 (7)	5344 (9)	1821 (10)	2409 (14)	
Type of collision					
Damage	5281 (94)	32,181 (56)	4891 (25)	6109 (31)	0.001
Injury	294 (5)	21,254 (38)	13,421 (70)	10,982 (62)	
Death	22 (1)	3293 (6)	938 (5)	609 (7)	
Total 99,275 (100)	5597 (5)	56,728 (58)	19,250 (19)	17,700 (16)	

DISCUSSION

According to the results of the present study, there is a significant relationship between accident variables and accident occurrence in different years. Furthermore, Iran is one of the countries with a high incidence of road accidents. Conducting comprehensive studies on the epidemiology of traffic accidents can be a great step toward controlling the risk factors and reducing the burden of death; the Ministry of Health and Traffic Police can play a critical role in this responsibility.

The findings of the present study reveal that most of the accidents occurred in September, which is consistent with the results of similar studies.[23-25] This is probably due to the increased rate of travel and congestion on the roads. Most of the accidents occurred on Thursday, which is consistent with the results of other relevant studies conducted by Hasani *et al.*,[26] Rodríguez *et al.*,[27] Brockwell *et al.*,[28] and Hernández *et al.*;[29] most of the accidents have occurred on the weekend due to the increased rate of travel on the weekend and less attention to safety rules that this shows a need for implementing more strict traffic regulations.

In this study, 56% of the accidents occurred in residential, official, and industrial areas, which is in line with the results of studies conducted by Bazargani *et al.*,[30] Vorko-Jović *et al.*,[31] Rodríguez *et al.*[27] but not in line with Mohtasham *et al.*[32] and Najimi *et al.* studies.[33] The justification for this result can be because of the high traffic rates and lack of observing traffic safety rules.

On the other hand, 73% of the accidents occurred in clear weather condition, which is not consistent with Sadeghi-Bazargani *et al.* studies,[30] and Ali Kamal *et al.*,[34]

Table 5: Distribution of traffic accidents according to weather

Year	Frequency (%)				P
	Unspecified	Clean	Foggy and rainy	Cloudy and misty	
2010	539 (3)	9531 (13)	697 (18)	590 (18)	0.001
2011	2387 (13)	9506 (13)	525 (14)	444 (14)	
2012	3311 (17)	8695 (12)	423 (11)	362 (11)	
2013	2768 (14)	8343 (11)	409 (11)	293 (9)	
2014	1288 (7)	8183 (11)	504 (13)	373 (11)	
2015	2435 (13)	6736 (9)	391 (10)	296 (9)	
2016	2662 (14)	7643 (10)	251 (6)	166 (5)	
2017	1491 (8)	7150 (10)	214 (6)	382 (11)	
2018	2280 (11)	8100 (11)	422 (11)	401 (12)	
Type of accident					
Damage	5820 (30)	39,100 (53)	2301 (60)	1701 (53)	0.001
Injury	11,987 (63)	32,555 (44)	1311 (34)	1042 (41)	
Death	1354 (7)	2232 (3)	224 (6)	204 (6)	
Total 100,191 (100)	19,161 (19)	73,887 (73)	3836 (4)	3307 (3)	

but it is in congruent with the findings of studies conducted by Zhang *et al.*[35] This is probably due to the geographical location of the study, an increased traffic rate in clear weather, as well as the lack of observing traffic safety rules, which can result in increased accidents; this shows a need for more observing traffic regulations.

The findings of the present study indicate that 66% of the accidents are related to light vehicles, which is consistent with the findings of studies conducted by Tavakkoli and Khanjani [36] and Razmara *et al.*[37] but is not in line with the finding of a study conducted by Bako *et al.*[38] This is probably due to the low safety, exciting, and violent behaviors of the drivers of these vehicles, which can cause catastrophic accidents.

According to the findings of this study, 58% of the accidents were due to collision of vehicle with bicycle and motorcycle; this finding was in agreement with those of studies conducted by Tavakkoli and Khanjani[36] and Lili *et al.*[39] The increased rate of accidents resulting in damage, injury, and death in West Azerbaijan Province is probably due to the high use of motorcycles and bicycles, low safety, and highly risky behaviors in this group.

In addition, findings of the current study indicate that 62% of the accidents occurred on main and rural roads, which is consistent with those of studies conducted by Anarkooli *et al.*,[40] Andrade and Mello-Jorge,[41] and Jalilian *et al.*[42] This is probably due to the lack of attention to the speed limit and traffic safety rules on the main roads, low road safety, poor monitoring of traffic rules on rural roads, and long distances between cities. The long distance between the cities can lead to unwillingness to stop at the roadsides and thus drivers continue driving while they are exhausted and cannot focus properly, which can result in severe accidents. Furthermore, according to the finding of the current study, 47% of the accidents were front-back and right-side crashes, which is not in line with the study conducted by Wahab *et al.*[43]

The limitations of this study are the lack of access to more details of recorded accidents as well as the inconsistency in the number of total cases recorded for each of the variables due to the lack of recording of some of the variables and the differences between the individuals who had recorded the data. One of the strengths of this study was a large size of data for the West Azerbaijan Province over a 7-year period and receiving variables on a month-to-month basis. It is also suggested that traffic accidents should be considered as one of the major problems in the province. Policymakers should be informed about the cost of traffic accidents in order to plan appropriate actions in the areas of prevention, treatment, rehabilitation, and supporting systems at the provincial and national levels. In this regard, the role of public education, periodic evaluation of executive programs, and improvement of the quality of roads and cars should not be ignored in reducing the burden of traffic accidents.

CONCLUSIONS

There are various factors affecting the occurrence of accidents. More and more specific investigations are needed to determine the contribution of each of the risk factors to these accidents and provide general guidelines. Moreover, the present study is a part of an Epidemiology thesis conducted by Omid Garkaz, and approved by the Ethics Committee of Urmia University of Medical Sciences with an ethical code of IR.UMSU. REC.1396.373. This study was funded by the Deputy of Research and Technology of Urmia University of Medical Sciences.

Conflicts of interest
There are no conflicts of interest.

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