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Epidemiological Pattern of Road Traffic Injuries among Occupants' Vehicles in 2012

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Abstract

There has been no precise information regarding occupants' status and their portion in traffic accident. By using traffic police information, epidemiological pattern of road traffic injuries among occupants' vehicles was analyzed in 2012. It was a cross sectional study. In this study, traffic police registered data in 2012 were used. Subjects were all occupants who had accident record in 2012 (81585: 77841 injured and 3744 death). Before analyzing, various preparatory steps including data control and merging were done after which data were processed. Findings showed that the mean age of the studied population was 28.7 ± 15.11 years. The highest percentage of accident occurred among car and motorcycle occupants respectively. The risk of death among the injured aged 30 - 59 years and 60+ were 1.20 and 2.23 times more than 30 years (as reference) respectively ($p < 0.001$). Risk of death among the injured in high ways, main roads and rural roads was 2.84 times more than in urban roads ($p < 0.001$). The risk of death among the injured was 2 times higher in high ways, main roads and rural secondary roads than streets ($p < 0.001$). Hence car and motorcycle occupants need urgent attention especially in motorways and high ways, main roads and rural secondary.

1. Introduction

Each year about 1.24 million people are killed in road traffic injury [1]. Road traffic injuries (RTIs) are the second leading cause of mortality in Iran. One study which was conducted in Iran in 2001 showed that 79% of traffic injuries occurred among men of 40 years old range. The share of occupants and passenger were 62% [2]. Hydari *et al.*'s study to clarify the main characteristics of motorcycle victims in Fars Province, Iran showed head injury was more prevalent than the other injuries. These patterns were associated with weak enforcement and low socioeconomic status and little education of motorcyclists as one of the vehicle occupants [3]. 1185 victims of road accidents have been studied by Ghadipasha *et al.* The morbidity and mortality caused by head injury was high and the reason may be traumatic brain injury or delay in diagnosis procedure. It looked that epidemiological data on road accidents were inadequate [4]. In 1987-2002, traffic injuries caused 25% of child death in America. 75% of road traffic death among children less than 14 years occurred up to 4 kilometers from the home. Road traffic death occurred in 60% of cases in the roads at speed less than 70 km/h [5]. Studies showed that among road traffic death, more than 120,000 people were occupants [6] [7]. In 2004, findings from one study conducted in America showed that among road traffic injury victims, 141 people were killed with air bag. Road traffic death cost among children under 14 years was 17.8 billion dollars. Road traffic injuries was more in rural than in urban area. Children who were sitting in the front seat were more prone to death. Fifty three percent of children did not use child restraint or seat belt. Child restraint usage was less in rural than in urban areas. Payment for child restraint is $45 which leads to $1800 profit for the society [8]. The findings of a study showed that the death rate among occupants, pedestrians and cyclists were 12.7, 1.6 and 0.3 per 100,000 populations [9]. There is no detailed information regarding occupants' status and their contribution to road traffic injuries in Iran which is crucial for evidence based policy making. In this study, traffic police registered information, time, place and person dimensions as component of epidemiological pattern in 2012 were analyzed to present epidemiological pattern of road traffic injuries among occupants' vehicles. The results as a reliable reference could be available for use by stakeholders in road traffic injury planning and policy making.

2. Methods

After taking Shahid Beheshti Uinversity of Medical Sciences Ethical Committee approval to the study, all police records for RTIs (81585: 77841 injured and 3744 death) in 2012 were investigated. RTI data was collected daily by the police at accident scenes using an advanced data registry system. Statistical analysis was performed using STATA (version 12.0) software. All accidents in which at least one passenger was injured was studied. During data controlling all duplicated and missing data were excluded. Demographic variables: gender, age, education, type of outcome, situation of accident was analyzed. Descriptive analysis of occupants' traffic injuries and death was performed. The presentation of the percentage of categorical variables and mean and standard

deviation were used for quantitative variables. Using logistic regression model to calculate the probability of death resulting to non-fatal injuries for the studied variables in occupants were used in two ways: univariate and multivariate. Odds ratios and 95% confidence interval was reported.

3. Results

Mean age of the subjects was 28.7 ± 15.11 years old. Mean age of the men and women were 26.9 ± 14.3 and 31.2 ± 15.8 years old, respectively.

Table 1 shows the risk of death which was estimated for some of demographic and

Table 1. The effect of demographic and accidental specification variables on risk of death using univariate analysis.

		Crude			
		OR	P value	95% CI	
Sex	Female	1.00	-	-	-
	Male	0.95	0.156	0.88	1.02
Age	<30	1.00	-	-	-
	30 - 59	1.50	0.000	1.37	1.63
	60+	2.52	0.000	2.20	2.87
Education	Illiterate	1.00	-	-	-
	12 years education & lower	0.56	0.000	0.48	0.67
	Bachelor & higher	0.60	0.024	0.39	0.94
Impact location	Lower limbs	1.00	-	-	-
	Head and neck	11.73	0.000	6.63	20.76
	Chest and abdomen	5.02	0.000	2.50	10.08
Driver's error	No error	1.00	-	-	-
	Harried driving	1.06	0.302	0.95	1.19
	Ignoring regulations	1.65	0.000	1.42	1.91
	Sleepiness/tiredness	3.77	0.000	3.25	4.37
Location					
	Urban ways	1.00	-	-	-
	Motor ways, high ways, rural ways	9.06	0.000	8.02	10.23
Weather condition					
	Fine	1.00	-	-	-
	Rainy or snowy	1.71	0.000	1.44	2.04
Light status	Day time	1.00	-	-	-
	Night time	0.97	0.501	0.89	1.06
	Sunrise	3.03	0.000	2.29	4.00
	Sunset	0.72	0.021	0.55	0.95
Impact					
	Side to side	1.00	-	-	-
	Head on	4.06	0.000	3.41	4.83
	Rear impact	1.43	0.000	1.19	1.72
	On fixed object	2.64	0.000	1.98	3.53
Road type					
	Street	1.00	-	-	-
	Highway	9.33	0.000	7.94	10.98
	Main road	10.90	0.000	9.36	12.69
	Rural secondary road	9.32	0.000	7.93	10.94

accidental specification using logistic regression model. Results of univariate analysis showed among studied variables the effect of variables on death except gender was significant (Table 1). Table 2 shows that the highest percent of injury was observed in semi-heavy vehicle such as car (57.30%) and motorcycle (28.91%) occupants respectively. The highest percent of death among semi-heavy vehicle car occupants was 66.30% too (Table 2). Table 3 shows the adjusted odds ratio (OR) for related risk factors after controlling effect of other causes. In comparison to univariate analysis the effect of some of variables on death of injured was not significant. Based on findings the risk of death among injured 30 - 59 years and 60 years and over was 1.20 and 2.23 times more than 30 years (as reference) respectively. The risk of death among illiterate victims was 31% higher than ones with 12 years education. Risk of death among head and neck and chest injury in comparison to lower limb injury was 5.34 and 2.35 respectively. Risk of death among injured in motor ways, high ways and rural roads was 2.84 times more than in urban roads. Also in rainy and snowy condition risk of death was 3.16 times among injured. Risk of death among occupants in face to face accident was higher than other kind of accidents. So the risk of death for injured was 2 times higher than side to side accident. The risk of death among injured was 2 times higher in high ways, main roads and rural secondary roads than urban roads (Table 3).

4. Discussion

Among all vehicles, car (semi-heavy vehicle) and motorcyclist (light vehicle) occupants

Table 2. Distribution of kind of accident by light, semi-heavy and heavy vehicles in 2012.

Kind of vehicle	Number (%)	
	Injury	Death
Light		
Bicycle	79 (0.10)	1 (0.03)
Motorcycle	22503 (28.91)	347 (9.27)
Semi-heavy		
Car	44601 (57.30)	2482 (66.30)
Taxi	1454 (1.87)	35 (0.93)
Van	4581 (5.88)	368 (9.82)
Mini Bus	858 (1.10)	57 (1.52)
Heavy		
Ambulance	40 (0.05)	1 (0.03)
Bus	1723 (2.21)	203 (5.42)
Agriculture	74 (0.09)	23 (0.61)
Truck	1915 (2.46)	223 (6.22)
Other	13 (0.02)	4 (0.11)
Total	77841 (100)	3744 (100)

Table 3. The effect of demographic and accidental specification variables on risk of death using multivariate analysis.

		OR	95% CI	
Sex	Female	1.00	-	-
	Male	0.92	0.79	1.07
Age	<30	1.00	-	-
	30 - 59*	1.20	1.02	1.41
	60+**	2.23	1.74	2.85
Education				
	Illiterate	1.00	-	-
	12 years education & lower*	0.69	0.55	0.86
	Bachelor & higher	1.09	0.66	1.76
Impact location				
	Lower limbs	1.00	-	-
	Head and neck**	5.34	2.64	10.77
	Chest and abdomen*	2.35	0.96	5.75
Driver's error	No error	1.00	-	-
	Harried driving	0.82	0.66	1.03
	Ignoring regulations	1.21	0.94	1.55
	Sleepiness/tiredness	1.18	0.88	1.59
Location	Urban Ways	1.00	-	-
	Motor ways, high ways, rural ways**	2.84	2.00	4.05
Weather condition				
	Fine	1.00	-	-
	Rainy or snowy**	3.16	2.32	4.29
Light status				
	Day time	1.00	-	-
	Night time	0.95	0.81	1.12
	Sunrise	1.39	0.80	2.40
	Sunset	0.95	1.52	
Impact				
	Side to side	1.00	-	-
	Head on**	2.25	1.66	3.04
	Rear impact	1.12	0.81	1.55
	On fixed object	1.48	0.89	2.48
Road type				
	Street	1.00	-	-
	Highway**	2.24	1.48	3.42
	Main road**	2.75	1.83	4.13
	Rural secondary road**	2.17	1.43	3.30

*p < 0.05, **p < 0.001.

were more injured. The risk of death was higher among injured 30 years and over, in motor ways and high ways, main roads and rural secondary. Results of a study on death caused by road traffic injury showed that 79% of death occurred among men in the age range of 40 years, 62% of them were occupants and pedestrian [2]. In line with current study Zangooei *et al* study findings identified fatal accident among all road user groups considering age, gender and head injury on deaths by age and gender at accident scenes. The ages of 21 - 30 among pedestrian, motorcyclist and motor vehicle occupant had a surging at fatality. Head injury was more prevalent too. Finding showed the most death occurred at scene among pedestrians aged 21 - 30, motorcyclists 41 - 50 and motor vehicle occupants 31 - 40 (10). Results from the American transport department study showed that among road traffic injury victims, 141 people were killed by air bag. In rural areas, road traffic injury was more and severe than in urban areas [10] [11]. The cost of injury and death caused by road traffic injuries among Iranian occupants were 587 and 451 million dollars, respectively [11]. The World Health Organization in its global report of road safety 2013 announced that the share of road users in Iran was: 28% passenger, 23% motorcyclist, 26% occupants and 23% drivers [12]. The study showed that car and motorcycle occupants were more injured than other road users. In other studies, pedestrians and motorcyclists were more vulnerable than others [13]-[15]. The World Report on Road Traffic Injury Prevention, published by the World Health Organization and the World Bank, states that road traffic crashes result in at least 1.2 million deaths and over 50 million injuries each year, that road traffic deaths and injuries are forecast to increase by more than 65% by 2020. Road traffic injury prevention was considered as prioritizing prevention programs. Among road users, occupants are also included [16] [17]. The study showed that the highest percent of injury occurred in car and motorcycle occupants and the highest percent of death were observed in car occupants. Other studies also showed that car and motorcycle occupants were more vulnerable road users [18]-[20]. The study showed risk of death was higher among injured 30 years and over, in motor ways and high ways, main roads and rural secondary. Suriyawongpaisal *et al* showed that a higher rural case-fatality rate was observed in comparison to urban areas [21]. Chang *et al* showed that there was the relationship between injury severity and driver/vehicle characteristics, highway/environmental variables and accidental specification variables. The most important variable associated with injury intensity was, pedestrians, motorcycle riders have higher risks of injury than other types of vehicle drivers.

The finding was in line with results from Chang's study [22]. The study showed that the highest percent of injury and death was observed in rainy or snowy weather condition. Other studies showed that rainy weather, mountainous area and other land users have the same effect on injury and death occurrence [23]-[25].

Reducing the road traffic injuries requires that increased attention be paid to improving the safety of occupants, cyclists and motorcyclists. Fifty percent of all road traffic deaths occur among these road users. Governments and policy making must focus on safety and mobility of these more vulnerable road users, and their safer transport

systems [26]. Hence policy makers should modify regulations in the event of occupants' safety as a priority. It seems that the public has to be more educated on seat belt usage in line with risk. In this study the rate of injury and death was high on the main roads. Intelligent system is necessary equipment in a country's major roads monitoring and custodians must consider its significance in road traffic injury prevention planning. Large volume of information could be the strength of the study. Data was collected at the scene, with some of information being incomplete. This deficiency could be considered as limitation of the study.

5. Conclusion

Among all vehicles, car (as a semi-heavy vehicle) and motorcycle (as a light vehicle) occupants were more injured. Hence car occupants and motorcyclist need urgent attention especially in motor ways and high ways, main roads and rural secondary because they are more vulnerable than other road users.

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Conflict of Interest

There is no conflict of interest.

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Authors Contribution

Elaheh Ainy, design, monitoring, data gathering, analysis and manuscript writing. Hamid Soori, design, monitoring data gathering, analysis and manuscript writing; Ali Khorshidi, analysis and manuscript writing; Ayad Bahadori Monfared, design and manuscript writing; Mashyaneh Haddadi, design, monitoring data gathering, analysis and manuscript writing.

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