Original Article

Social Differences in the Prevalence of Road Traffic Injuries among Pedestrians, and Vehicle and Motorcycle Users in Iran: Results of a National Multiple Indicator Demographic and Health Survey (IrMIDHS, 2010)

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Abstract

Background: Traffic injuries are considered as the most important health issues for different countries in the world, especially developing countries that are experiencing rapid social changes. The purpose of this study was to investigate the prevalence of road traffic injuries (RTIs) and its socioeconomic differences among road users in Iran as it is one of the countries with high rates of accidents in the world. The study population included all people in Iran. The target sample was 3,096 clusters consisting of 2,187 urban and 909 rural households. **Methods:** Source of the raw data was the Iran's Multiple Indicator Demographic and Health Survey (IrMIDHS) 2010, which is a multi-stage stratified cluster-random cross-sectional study. The logistic regression has been performed for investigating the socioeconomic determinants which influence the RTIs among pedestrian, vehicle, and motorcycle users. **Results:** The prevalence of RTIs is 13.8 (95% CI: 13.1, 14.5) per 1,000 people in the year leading up to the study. The injured groups included pedestrians (14.37%), vehicles (38.36%), motorcyclists (43.37%), and 3.9% of users injured with other vehicles. A total of 78.3% of the injured people underwent outpatient treatment or were hospitalized. The mean age in these three groups was significantly increased (27.9, 32.5, 33.4, respectively), and the proportion of men decreased (89.2, 75.2, and 60.6). **Conclusions:** RTIs in Iran are higher than previous estimates due to consideration of non-hospitalized cases. Considering the high contribution of human factors in developing countries, these measures should prioritize vulnerable groups.

Keywords: *Crush injury, motor vehicles, pedestrian, socio-economic factor, traffic accidents*

Introduction

Traffic injuries are a serious and important contributor to socioeconomic and health challenges globally, especially in developing countries[1] that are experiencing social transition and rapid changes.[2] These injuries are one of the major causes of death in the first four decades of life.[3] The fraction of global deaths caused by injuries (5.1 million deaths) was slightly higher in 2010 (9.6%) than two decades earlier (8.8%), which is due to a 46% increase in deaths caused by road traffic injuries (RTIs) worldwide (1.3 million in 2010).[4] The different injuries account for a total of 11.2% disability-adjusted life years (DALYs), out of which road injuries account for the largest proportion (27% of all injuries).[5] In addition to causing suffering to humans, RTIs are also responsible for economic losses of 1% to 1.5% of gross national product (GNP) in low and middle income countries (LMICs).[6] This cost for total road traffic accidents (RTAs) in Iran was estimated to be about 72,465 billion IRR (US$7.2 billion), costing 2.19% of Iran's gross domestic product (GDP).[7] Iran is a developing country with a population of over 75 million and 17 million vehicles (in 2008),[8] which has undergone various transitions.[9] It is one of the few countries in the Eastern Mediterranean that has undertaken studies to estimate the national cost of death and traffic injuries for the past decade.[10] Traffic accidents are the most important cause of death due to injuries and loss of life (1,071 million DALYs) among men in Iran. This factor has been the fourth type of injury for women that leads to a loss of life (235,000 DALYs).[11] Many epidemiologic studies have been conducted on road accidents[12] and injuries[13] in Iran, focusing mainly on mortality caused by accidents. Most of these studies have taken advantage of police, forensic

How to cite this article: Roshanfekr P, Malek Afzali Ardakani H, Sajjadi H, Khodaei-Ardakani MR. Social differences in the prevalence of road traffic injuries among pedestrians, and vehicle and motorcycle users in Iran: Results of a national multiple indicator demographic and health survey (IrMIDHS, 2010). Int J Prev Med 2019;10:98.

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Access this article online

Website: www.ijpvmjournal.net/www.ijpm.ir

DOI: 10.4103/ijpvm.IJPVM_206_18

Quick Response Code:

medicine, or hospital registry data[11,14] to arrive at the results. Iran implemented a relatively accurate death registration system (DRS).[15] This system is currently able to record 98% of deaths within 10 days; however, death registry statistics mainly show the tip of a "pyramid" in terms of the health consequences caused by accidents, and population-based studies are needed to get a more accurate picture of the rest of the burden as represented by this pyramid (injuries and disabilities). So far, the population-based studies have not been carried out at a national level on road injuries, for all age groups, so as to assess the socio-economic distinctions of the injured on a large scale. The first National Demographic and Health Survey (DHS) was conducted in Iran in 2006 and the second in 2010[16]; the third one was completed in 2015, the information of which is still unreleased and unavailable. Currently, the most accurate population-based data in this regard are the Iran's Multiple Indicator Demographic and Health Survey (IrMIDHS) of 2010. Although it has not been investigated for traffic-related injuries, the advantage of the DHS study is that it is currently conducted using similar protocol in over 90 developing countries of the world,[17] and though some adjustments were made to it in Iran,[16] it is possible to compare its data with other countries. The aim of this study was to fill this information gap and obtain a picture of the prevalence of road accidents and its socioeconomic differences in different populations and road users based on a valid national large-scale study.

Methods

Data and settings

The study data were extracted from the IrMIDHS, which is a national survey of the households. This survey was conducted by the National Institute of Health Research and Ministry of Health in 2010.

The primary objectives of IrMIDHS were to provide rigorous data on the health and population at the national and provincial levels for assessing a range of social indicators and their influences on health, and to assist policy makers and program managers to design effective strategies to promote health outcomes and provide equitable access to health care in Iran.[16] In this cross-sectional survey, multi-stage stratified cluster sampling was used.

All household members who were permanent residents (more than 6 months) of the household (including immigrants and refugees) were eligible for inclusion in the household members list (de jure approach). In each district, clusters were identified randomly; then, in each cluster, a systematic sample of 10 households was selected.

Sampling and sample size

The sampling framework was developed using Iran's 2006 population and housing Census. The target sample was 3,096 clusters consisting of 2,187 urban and 909 rural clusters. Except for a few indicators, all the indicators were reported at provincial levels. Mortality indicators, accidents, and disability rates were presented at a national level only.

Data gathering tools

The data of IrMIDHS 2010 were collected using three types of questionnaires, previously validated, and showed relative content validity through expert panel opinions. One type of questionnaire was completed for households (107 questions), the second type was for females in the age group of 15 to 54 years (145 questions), and the last questionnaire was for children younger than 5 years (88 questions). This study was conducted using the data of 29,609 household questionnaires (response rate = 95%) which were completed through face-to-face interviews with household members. We used the data related to the following items: RTI as the study's binary outcome variable (yes vs. no) was reached by asking the respondents two questions in the survey: *have you, or any other family member, been injured within the last year* (October 2009–October 2010). If answer was yes, the next question about the type of injury was asked and the available options were: *injured as a pedestrian in a vehicle crash*; *injured in a car accident (as driver or occupant)*; *injured in a motorcycle accident (as rider or pillion rider)*; and *injured in other types of traffic accidents (cart, bicycle, rail track, etc.)*.

Independent variables

The variables evaluated as potential predictors based on literature and availability of data in IrMIDHS included sex (female [as reference group: r] vs. male), location of residence (urban [r] vs. rural), age group categorized into seven age groups: (0–9 [r], 10–19, 20–29, 30–39, 40–49, 50–59, and above 60 years old), last educational level (illiterate [r], preschool, primary school or basic education [Degrees in Literacy Movement Organization of Iran—LMOI], pre-intermediate, intermediate, and university or college including theological college [Hawza]), activity status based on Census classification (employed [r], have income no job, homemaker, student in school or college, and unemployed or looking for job), have basic insurance (yes vs. no), have supplementary insurance (yes vs. no), household income that was asked in form of five income groups (under 250,000 IRR; 250,000–500,000 IRR; 500,001–1,000,000 IRR; 1000,001–200,000 IRR; and more than 2,000,000 IRR), property ownership statues (owner, rental, other), and have basic health insurance (yes vs. no). In the analysis, we approached a quartile by combining the two top income groups.

Statistical analysis

Extracted data were analyzed using SPSS-PC Version 18.0 (SPSS Inc., Chicago, IL, USA) and released version of stata. 12 (1985–2011 LP STATA Corp., TX, USA).

Table 1: Road traffic injuries (RTIs) prevalence and socio-economic differences among pedestrian, vehicle and motorbike user in Iran (IrMIDHS 2010)

Variables	*N*	Pedestrian			*P*	Vehicle			*P*	Motorbike			*P*
		Prevalence per 1,000	95% CI			Prevalence per 1,000	95% CI			Prevalence per 1,000	95% CI		
Total	11,1415	1.98	1.73	2.26		5.30	4.88	5.74		5.99	5.54	6.46	
Residency													
Rural	35,534	1.60	1.22	2.08	0.051	4.42	3.76	5.16	0.006	7.32	6.46	8.26	0.000
Urban	75,881	2.16	1.84	2.52		5.71	5.18	6.27		5.36	4.86	5.91	
Sex													
Male	56,849	2.36	1.98	2.79	0.004	7.81	7.10	8.57	0.000	10.47	9.65	11.34	0.000
Female	54,566	1.59	1.28	1.97		2.68	2.26	3.15		1.32	1.03	1.66	
Age													
0-9	17,812	2.30	1.65	3.12	0.001	1.85	1.28	2.60	0.000	1.29	0.82	1.94	0.000
10-19	19,518	1.49	1.00	2.13		2.92	2.21	3.78		9.02	7.74	10.44	
20-29	25,021	1.80	1.31	2.41		7.31	6.30	8.45		9.67	8.50	10.96	
30-39	17,741	1.58	1.05	2.28		8.17	6.90	9.61		6.14	5.05	7.41	
40-49	13,084	1.61	0.99	2.45		7.03	5.67	8.62		4.36	3.30	5.64	
50-59	9,224	2.49	1.58	3.74		6.29	4.78	8.12		3.90	2.74	5.40	
>60	9,015	3.77	2.61	5.27		2.44	1.53	3.69		2.66	1.71	3.96	
Education (>5 years)													
Uneducated	15,657	3.26	2.43	4.28	0.004	3.13	2.32	4.14	0.000	3.39	2.54	4.43	0.000
Pre-school	1,770	2.82	0.92	6.58		3.39	1.25	7.36		1.69	0.35	4.95	
Primary school and basic (Nehzat)	26,745	1.91	1.42	2.51		3.93	3.21	4.75		5.01	4.20	5.93	
Pre-intermediate (guidance school)	18,492	1.41	0.92	2.06		6.87	5.73	8.17		9.84	8.47	11.37	
Intermediate (high school)	26,269	1.79	1.31	2.38		7.23	6.24	8.33		8.79	7.70	10.00	
University and religious college (Hozeh)	13,138	1.83	1.17	2.72		7.54	6.13	9.17		3.81	2.83	5.01	
Activity status (>10 years)													
Employed	30,948	1.71	1.28	2.24	0.000	9.47	8.42	10.61	0.000	10.95	9.82	12.18	0.000
Have income no job	6,228	4.50	2.99	6.49		5.14	3.52	7.25		3.21	1.96	4.96	
Housekeeper	27,074	1.44	1.02	1.97		2.81	2.21	3.51		1.22	0.84	1.71	
Student (school or college)	10,291	2.04	1.26	3.12		5.05	3.78	6.62		8.65	6.95	10.63	
Unemployed (or look for job)	9,485	3.06	2.05	4.39		8.54	6.79	10.60		12.86	10.69	15.34	
Basic insurance													
No	20,394	2.84	2.16	3.68	0.002	5.34	4.39	6.44	0.907	7.99	6.82	9.31	0.000
Yes	90,923	1.79	1.53	2.09		5.28	4.82	5.77		5.53	5.06	6.04	
Supplement insurance													
No	97,925	1.91	1.65	2.20	0.135	5.15	4.71	5.62	0.065	6.29	5.80	6.81	0.000
Yes	13,490	2.52	1.75	3.52		6.38	5.10	7.87		3.78	2.82	4.97	
Household income per month (IRR)													
Less than 250,000	31,718	2.40	1.89	3.00	0.066	4.54	3.83	5.34	0.029	8.07	7.12	9.12	0.000
250,000-500,000	47,986	1.67	1.32	2.07		5.65	5.00	6.36		5.63	4.98	6.34	
500,000-1,000,000	18,510	2.54	1.87	3.38		6.10	5.03	7.34		4.43	3.52	5.50	
1-2 million	2,786	1.08	0.22	3.14		8.26	5.24	12.36		1.08	0.22	3.14	
More than 2 million	450	2.22	0.06	12.32		4.44	0.54	15.96		0	0	0	

A *P* value of less than 0.05 was considered as statistically significant. Crude and adjusted odds ratios (AORs) as well as 95% confidence intervals (CI) were reported. Variables with a *P* value <0.2 in the bivariate analysis were entered into the multivariable regression model. The study protocol did not allow substitution of non-responses by another household member; all efforts were made to minimize non-response.

The external validity of data was also checked out with comparison of the age composition of IrMIDHS with the last national censuses of population and housing in 2006 and 2010 as well as household size and literacy composition in both.[18]

Ethical consideration

The different stages of the IrMIDHS are approved. More data about sampling data gathering and ethical issues of IrMIDHS were discussed comprehensively in the study protocol.[16]

Results

According to the information obtained from 111,415 samples, the number of those injured by RTIs is 1,538 with a mean age of 30.67 ± 16.03 and a male proportion of 79.2% in the whole country. In terms of the RTI treatment, the rates of injured who were hospitalized, underwent outpatient treatment, resorted to home remedies, and those who took no action after the injury are 39.08%, 39.21%, 7.67%, and 14.04%, respectively, according to Table 1 the proportion of RTIs among pedestrians is 14.4% (12.6, 16.1), vehicle users is 38.4% (35.9, 40.8), and motorcycle users is 43.4% (40.9, 45.8). The mean age and gender ratio of the injured are as follows: the pedestrians (22.8 ± 33.27) with male population of 60.6%, vehicle users (32.54 ± 14.5) with male population of 75.2%, and motorcycle users (27.94 ± 13.9) with male population of 89.2%. The prevalence of RTIs is 13.8 (95.1% CI: 13.1, 14.5) per 1,000 people. The prevalence of RTIs among pedestrians is 1.98 (1.73, 2.26) per 1,000 people, which is 1.35 times higher in urban areas than in the rural areas (2.16 vs. 1.60; *P* value = 0.051). RTIs is 1.48 times more prevalent among men than women (2.36 vs. 1.59; *P* value = 0.004). The highest prevalence in the above-60 age group (*P* value = 0.001) with a prevalence of 3.77 (2.61, 5.27) per 1,000 people, uneducated individuals (*P* value = 0.004) with prevalence of 3.6 (2.43, 4.28), and the unemployed individuals (*P* value = 0.000) with a prevalence of 3.06 (2.05, 4.36) per 1,000 people is higher than other educational and activities groups. The prevalence of RTIs among vehicle drivers or passengers was 5.30 (4.88, 5.74) per 100 people, which is 1.37 times higher in urban areas than in rural areas (5.71 vs. 4.42; *P* value = 0.006). Moreover, this type of RTI is 2.9 times more prevalent among men than women (7.81 vs. 2.68; *P* value = 0.000). The highest prevalence in the 30 to 39 age group (*P* value = 0.000) with a prevalence of 8.17 (6.90, 9.61) per 1,000 people and the prevalence of these injuries in individuals with university education (*P* value = 0.000) with a prevalence of 7.54 (6.13, 9.17) and employed individuals (*P* value = 0.000) with a prevalence of 9.47 (8.42, 10.61) per 1,000 people is higher than other educational and activities groups. The prevalence of RTIs in motorcycle users is 5.99 (6.45, 5.54) per 1,000 people, which is 1.36 times higher in rural areas than in urban areas (7.32 vs. 5.36; *P* value = 0.000). The prevalence of RTIs among male users is 7.9 times more than female users (10.47 vs. 1.32; *P* value = 0.000). The highest prevalence in the 20 to 29 age group (*P* value = 0.000) with a prevalence of 9.67 (8.50, 10.96) per 1,000 people and among individuals with middle school education (*P* value = 0.000) with a prevalence of 9.84 (8.47, 11.37) and the unemployed individuals (*P* value = 0.000) with a prevalence of 12.86 (10.69, 15.34) per 1,000 people is higher than other educational and activity groups.

With an increase in the income level from the lowest to the highest income quintiles, prevalence of RTIs has decreased by 89.4% among motorcycle users (8.07 vs. 0.92; *P* = 0.000) and increased by about 41.04% among vehicle users (4.54 vs. 7.70; *P* = 0.029) (the two high income groups are combined). The results of the bivariate and multivariate analyses are presented in [Table 2].

In the multivariable logistic regression model, the female sex (AOR = 0.61, 95% CI: 0.38, 0.97), unemployed (or looking for a job) persons (AOR = 1.82, 95% CI: 1.10, 2.99), people having basic insurance (AOR = 0.59, 95% CI: 0.40, 0.87) remained independently significantly associated with RTIs in the pedestrian. There are significant associations between the RTIs in vehicle users and female sex (AOR = 0.39, 95% CI: 0.29, 0.54); age groups, for example, 30 to 39 years old (AOR = 2.63, 95% CI: 1.54, 4.49); and pre-intermediate student (AOR = 1.59, 95% CI: 1.07, 2.35). We observed statistically significant associations between RTIs in motorcycle users and female sex (AOR = 0.61, 95% CI: 0.38, 0.97), age groups along with reduced risk (from AOR = 6.29, 95% CI: 3.39, 11.66, among 10- to 19-year-olds to AOR = 1.81, 95% CI: 0.98, 3.35, among 50- to 59-year-olds), high level of education (university, college, and so on; AOR = 0.59, 95% CI: 0.36, 0.97), have basic insurance (AOR = 0.81, 95% CI: 0.65, 1.00), and increase in household income per month (IRR) has correlation with decrease in odds of experiencing the event from 27% in 250,000 to 500,000 IRR (AOR = 0.73, 95% CI: 0.60, 0.89) to 84% in above one million IRR (AOR = 0.16, 95% CI = 0.05, 0.50).

Discussion

The proportion and prevalence of RTIs in Iran in terms of road-user groups was least among pedestrians, was higher among vehicle users, and most among motorcycle users. This finding is consistent with global evidence[19] in terms of distribution among the road user groups, although the proportion of injury in motorcyclists is similar with the same proportion in low income countries, which is consistent with other research findings in Iran, in which motorcycling is the main cause of RTIs.[20] Although the number of motorcycle users is lower than that of vehicle users in Iran, research has shown that a major part of deaths and injuries occur in motorcycle users, especially in rural areas,[21] which is consistent with the results of this study. This can be attributed to both high vulnerability of motorcycles as two wheelers and the high-risk behaviors of its users,[22,23] as well as lack of sufficient rules and control interventions in this regard, compared with other vehicle users.[24,25]

Table 2: Bivariable and multivariable analyses of social determinant of road traffic injuries (RTIs) among pedestrian, vehicle, and motorbike user in Iran

Variables	Pedestrian					Vehicle					Motorbike				
	Crude	Adjusted				Crude	Adjusted				Crude	Adjusted			
	OR	OR	95% CI		*P*	OR	OR	95% CI		*P*	OR	OR	95% CI		*P*
Residency															
Rural	1	1				1	1				1	1			
Urban	1.35	1.31	0.88	1.94	0.188	1.29	1.04	0.84	1.29	0.697	0.73	0.87	0.72	1.06	0.158
Sex															
Male	1	1				1	1				1	1			
Female	0.68	0.61	0.38	0.97	0.035	0.34	0.39	0.29	0.54	0.000	0.12	0.14	0.10	0.22	0.000
Age															
0-9	1	empty				1	empty				1	empty			
10-19	0.64	0.73	0.32	1.71	0.474	1.58	1.08	0.56	2.09	0.815	7.04	6.29	3.39	11.66	0.000
20-29	0.78	0.80	0.41	1.54	0.500	3.97	2.15	1.25	3.71	0.006	7.55	4.33	2.40	7.78	0.000
30-39	0.69	0.83	0.43	1.60	0.583	4.44	2.63	1.54	4.49	0.000	4.78	2.68	1.48	4.86	0.001
40-49	0.70	0.70	0.36	1.34	0.281	3.82	2.33	1.36	3.97	0.002	3.38	1.83	0.99	3.38	0.053
50-59	1.08	0.83	0.46	1.49	0.526	3.41	2.26	1.33	3.82	0.002	3.03	1.81	0.98	3.35	0.057
>60	1.64	omitted				1.32	omitted				2.06	omitted			
Education															
Uneducated	1	1				1	1				1	1			
Pre-school	0.87	empty				1.08	empty				0.50	empty			
Primary school and basic (Nehzat)	0.58	0.65	0.39	1.09	0.102	1.26	1.00	0.68	1.47	0.987	1.48	1.25	0.85	1.83	0.261
Pre-intermediate (guidance school)	0.43	0.55	0.30	1.02	0.059	2.20	1.59	1.07	2.35	0.020	2.93	1.31	0.89	1.95	0.173
Intermediate (high school)	0.55	0.57	0.32	1.01	0.053	2.32	1.39	0.94	2.06	0.098	2.61	1.06	0.71	1.57	0.789
University and religious college (Hozeh)	0.56	0.52	0.26	1.06	0.072	2.42	1.20	0.77	1.88	0.421	1.12	0.59	0.36	0.97	0.037
Activity status															
Employed	1	1				1	1				1	1			
Have income no job	2.63	2.40	1.37	4.21	0.002	0.54	0.93	0.61	1.42	0.729	0.29	0.78	0.46	1.34	0.371
Housekeeper	0.84	1.18	0.64	2.17	0.602	0.29	0.79	0.53	1.18	0.251	0.11	0.72	0.42	1.22	0.220
Student (school or college)	1.19	1.62	0.80	3.28	0.181	0.53	0.98	0.65	1.46	0.907	0.79	0.86	0.62	1.19	0.368
Unemployed (or look for job)	1.79	1.82	1.10	2.99	0.019	0.90	1.27	0.96	1.67	0.090	1.18	1.03	0.81	1.30	0.821
Basic insurance															
No	1	1				1	1				1	1			
Yes	0.63	0.59	0.40	0.87	0.009	*	*				0.69	0.81	0.65	1.00	0.024
Supplement insurance															
No	1	1				1	1				1	1			
Yes	1.32	1.24	0.75	2.04	0.406	1.24	1.16	0.88	1.52	0.228	0.59	1.24	0.89	1.71	0.198
Household income per month (IRR)															
Under 250 000	1	1				1	1				1	1			
250,000-500,000	0.70	0.74	0.51	1.09	0.130	1.25	1.05	0.83	1.31	0.702	0.70	0.73	0.60	0.89	0.002
500,000-1,000,000	1.06	1.07	0.66	1.74	0.776	1.35	1.05	0.79	1.41	0.735	0.55	0.64	0.48	0.85	0.002
More than 1 million	0.52	0.72	0.25	2.08	0.549	1.71	1.42	0.89	2.27	0.141	0.11	0.16	0.05	0.50	0.002

*OR with *P*> |z|more than 0.2 is omitted

In terms of age–gender combination, the highest prevalence of RTIs among pedestrians was seen in the elderly over the age of 60 years (3.8 per 1,000); among vehicle users, was middle-aged people of 30 to 39 years (8.2 per 1,000); and among motorcycle users, was young people aged 20 to 29 (9.7 per 1,000). The mean age decreased (33.3, 32.5, and 27.9) and the male proportion increased (60.6%, 75.2%, and 89.2%), respectively. The dominant male prevalence and risk of RTIs in this study are consistent with other studies carried out in Iran and other countries. A study was performed based on all recorded police data on accidents between March and June, 2010, in Iran and included 53,888 cases, 91.83% were male injuries with a male to female ratio of 13:1.[26] Other studies in Iran, Brazil, and

New Zealand report that men are more affected as they comprise a significantly higher proportion as drivers, whereas women are mostly injured as pedestrians.[27-31]

In this study, university education has a significant association with decreasing odds of experiencing the event. Another study conducted in Fars province of Iran indicates that the highest and lowest of RTI-related deaths occurred among the illiterate victims and university graduates, respectively.[32] The results of a study on police road accident records between April 2008 and March 2009 in Iran show that university students have an 81% lower chance of being affected by RTIs compared with illiterate individuals.[33] The results of a cohort study in Sweden show that young motorcyclists with poor financial status are more at risk of moderate to severe injuries than rich people.[34] The findings of this study also show a significant correlation between increase of income and decrease in odds of the event among motorcyclists. Another study in Spain has shown that people with a low socioeconomic status face high levels of stress that prevent concentration during driving, resulting in high-speed driving and losing control of the car with subsequent accidents. The RTI-induced mortality among educated people is lower than that of the illiterate people.[35] A study in South Korea estimates a higher risk of road accident injuries and deaths among disadvantaged people with lower level of education.[36] The findings of this research are consistent with most similar studies in other countries and show the high risk of RTIs among vulnerable and disadvantaged groups, and the risk of RTIs in male unemployed pedestrians is higher than that of the other groups. The same risk in male middle-aged individuals with intermediate education level is higher than other groups and the highest among unemployed young male motorcycle users with low income and no university education. Overall, the prevalence of RTIs in Iran (95% CI: 13.1, 14.5) was 13.8 per 1,000 people and its ratio was 1.38% in the population studied.[37]

The findings of this study indicate that RTIs in Iran are higher than previous estimates.[37] This result can be further substantiated because in the past, there have not been any major national or large-scale surveys conducted on the prevalence of injuries in Iran, and studies have often used hospital or police records. Thus, in their definition of injury, the previous studies did not consider cases such as those treated with home-based remedies or those left untreated and therefore not registered anywhere, while in this research all these cases are calculated as RTIs. Bahadorian *et al*. calculated the rate of RTIs as 555 per 100,000 people in Iran while performing calculations based on data from 2004 to 2011; however, if we only consider the injuries that led to hospitalization, we will obtain the figure of 539.4 per 100,000 people, which confirms the previous statement indicating the lack of inclusion and consideration of injuries that were treated using outpatient services, home remedies, or just left untreated. Furthermore, our findings show that only 39% of injuries lead to hospitalization, and 21% of RTIs are treated using home remedies or left untreated and not recorded anywhere. Another survey[38] was performed in Tehran (which comprises 16% of Iran's population) for the year leading up to this study that estimated the annual incidence of RTIs as 13.1 (95% CI: 10.8–15.6) per 1,000 people, which can be an estimation of the national incidence rate in the same year. Moreover, the explanation for this figure being higher than the national average could be associated with the high concentration of population and vehicles in the Iranian capital (Tehran). The findings of another comparative study in Iran have reported higher numbers (of approximately 747 injured in 100,000 people) for the year leading up to this study.[39]

In conclusion, despite the method of estimation, different studies in Iran show that serious attention is needed in this regard for Iran,[39] and a comparison of RTIs per 100,000 people in Iran with other countries in the same years confirm this result especially considering the ambitious goal set as part of the sustainable development goals (SDG) to reduce the RTI-related death toll by 50% by 2020 (SDG Target3.6).[40,41]

Research limitations

The limitations of this study include an insufficient sample size to perform analysis at sub-national levels, by province and cities, so as to identify the regional and national as well as the overall differences; interpretability of the meaning of injury from the respondents' points of views; the probability of recall bias; the impossibility of analyzing the RTIs data for intra- and inter-city cases, and the driver's and occupants; lack of information on the severity of injury; not being able to identify the type of vehicle and its safety; failure to recognize the accident to injury ratio; and finally lack of questions about the consequences of these injuries. In addition to showing the trend over the past few years, we can also test the accuracy of these research data by analyzing the data of the new IrMIDHS study conducted for Iran in 2015, but its results have not been published yet.

Acknowledgments

This article was obtained from a PhD thesis titled "Inequality analysis of road traffic accidents' health outcomes in Iran and associated social determinants (using CSDH-WHO Model)." We gratefully thank all those who provided insight and expertise that greatly assisted us in conducting this study.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Received: 04 May 18 **Accepted:** 05 July 18
Published: 07 Jun 19

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