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Prevalence and Socio-Economic Determinants of Disabilities Caused by Road Traffic Accidents in Iran; A National Survey

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ABSTRACT

Objective: To determine the prevalence and socio-economic disparity among victims with disabilities caused by RTAs in Iran as country with a high rate of accidents.
Method: The source of data was the Iranian Multiple Indicator Demographic and Health Survey, a nationwide cross-sectional study. The sampling framework was based on the population and housing census for Iran in 2006. Provincial samples ranged from 400 to 6,400 households. The target sample was 3,096 clusters consisting of 2,187 urban and 909 rural clusters. In the present study, all but a few indicators are reported at provincial levels. Mortality indicators, accident and disability rates, low birth weight rate and young age at marriage rates are presented at the national level only. Logistic regression was performed to investigate the individual and family factors influencing RTAs that lead to disability in Iran.
Results: The period prevalence (12 months) of road traffic accident disabilities (RTADs) in the total population of 111415 was 30.52 (95% CI: 21.13.41.64) per 100,000 individuals. Among those who had been injured during the year leading up to the study, the proportion of disabilities caused by RTAs was 31.67 (95% CI; 8.51.54.97) per 1000 pedestrians, 20.99 (95% CI: 13.37.30.75) per 1000 motorcyclists, 18.64 (95% CI: 7.71.29.57) per 1000 vehicle drivers. Multivariate logistic regression analysis showed that the risk of RTADs differed significantly in relation to age (AOR 50-59 vs. 0-9=10. 78, p=0.05); activity status (AOR unemployed vs. employed=4.72, p=0.001) and family income (AOR q2 vs. q1=0.37, p=0.048) of the victim.
Conclusion: In addition to the risks associated with socio-economic groups, particularly vulnerable groups, RTADs have consequences which can lead to further marginalization of individuals, can affect their quality of life and damage the community as a whole.

Keywords: Traffic accidents; Disability persons; Socioeconomic factor; Pedestrian; Disparity health status; Motor vehicles.

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Introduction

The pattern of diseases has changed in developing countries from communicable diseases to non-communicable diseases and injuries [1]. Moreover, in recent decades road traffic accidents (RTAs) have become a major public health problem worldwide, especially in developing countries experiencing socio-economic transition [2, 3]. According to the World Health Organization, every year there are over 1.2 million deaths due to RTAs, 20 to 50 million people sustain injuries and more than 5 million remain disabled for life [2]. RTAs cause disability in the short and long term and are the ninth-leading cause of disability-adjusted life years (DALYs) globally. They generate 41.2 million years of healthy life lost, thus accounting for 2.7% of the total healthy life lost worldwide [4-6]. There are few financial cost estimates for non-fatal injuries caused by (RTAIs), including those causing disabilities, but the increased financial burden to individual families is reported to include the additional cost of prolonged care, loss of the primary household income, higher health expenditures to achieve a standard of living equivalent to that of non-disabled people and loss of income due to disability [4, 7].

When investigating the effects on RTAI victims, analysis of disability can provide a complementary view of this event and provide the necessary information for prevention and control of RTAs to minimize the risk of premature death and disability. Despite a relative reduction in the number of deaths in recent years, Iran has a high rate of RTAIs [8]. The 2010 Global Burden of Disease (GBD) study, lists RTAIs as the leading cause of death in the 15 to 49 year age group (23.6%) [9]. RTAIs rank third at 7.3% after ischemic heart disease (9.1%) and low back pain (9%) for DALYs in Iran [9] which caused a 1.3 million year loss in the Iranian population in 2005[10].

Ameratunga *et al*. found that, despite well-publicized declines in traffic fatality rates, even in industrialized countries, the effect of RTAIs on the loss of healthy years of life remains largely speculative. This reflects a lack of reliable data about non-fatal outcomes following RTAs, even in countries where detailed mortality statistics are reported annually [11]. In much of the world, routinely collected data on RTA-related disabilities are non-existent or inaccessible [4, 11].

In Iran, the prevalence of RTADs is increasing; therefore, a plan for control and prevention of disabilities must be a high priority for health policymakers [12]. The 2011 census results list a disability prevalence of 135 per 10000 individuals in Iran[12]. The pattern of disability in a particular country is influenced by health conditions and environmental and factors such as RTAs, natural disasters, conflict, diet and substance abuse [13]. Studies on the epidemiology of injuries in Iran in recent years [14, 15] have failed to provide sufficient information about disabilities caused by accidents. The aim of the present study is to provide an epidemiological overview of the prevalence of RTADs and variations related to socio-economic status using data from a major national study.

Materials and Methods

Data and Setting

The study data was extracted from the Iran Multiple Indicator Demographic and Health Survey (IrMIDHS), a national survey of households. This survey was conducted by the National Institute of Health Research and the Ministry of Health in 2010. The primary objectives of the IrMIDHS was to provide rigorous data on health and population at the national and provincial levels to assess a range of social indicators and their influences on health. The goal was to assist policymakers and program managers when designing effective strategies that promote healthy outcomes and provide equitable access to health care in Iran [16].

This cross-sectional survey used multi-stage stratified cluster sampling. Because there are significant differences in population size in the different provinces and districts within provinces, each province's share in the total sample size as well as the regional share within the provinces were specified. All household members who were permanent residents (for more than six months), including immigrants and refugees, were eligible for inclusion as household members (de jure approach). In each district, clusters were identified randomly and in each cluster a systematic sample of 10 households was selected.

Sampling and Sample Size

The sampling framework was based on the population and housing census for Iran in 2006. Provincial samples ranged from 400 to 6,400 households. The target sample was 3,096 clusters consisting of 2,187 urban and 909 rural clusters. In the present study, all but a few indicators are reported at provincial levels. Mortality indicators, accident and disability rates, low birth weight rate and young age at marriage rates are presented at the national level only.

Data Gathering Tools

The data in the IrMIDHS-2010 was collected using three questionnaires which previously had been validated. These were a questionnaire for households (107 questions), for females aged 15-54 years (145 questions) and for children younger than five years (88 questions). The questionnaires were researcher-made and showed a relative content validity through expert panel opinion[16]. The present study used data from 29,609 household questionnaires (response rate, 95%) which were completed by conducting

face-to-face interviews with household members. A multi-layer supervision and monitoring procedure was established and the data of all questionnaires were entered twice. The central team conducted a subsequent check of a random sample of the variables. The missing was at random and did not violate the representativeness of the sample.

The data was obtained using the following questions for RTAIs as the study's binary outcome variable (yes or no): (1) *Have any family members been injured during last 12 months (October 2009 to October 2010)?* The next question focused on the type of injury and the options considered: (2) *Was the injured a pedestrian involved in an accident with a vehicle, in a car accident (as the driver or occupant), in a motorcycle accident (as the driver or occupant) or in other traffic accidents (cart, bicycle, tractor, etc).*

The independent variables evaluated as potential predictors were based on the literature and the availability of data in IrMDHS. They were sex (female [as the reference group: r] versus male), location of residence (urban [r] versus rural), age group in years (0-9 [r]; 10–19; 20–29; 30-39; 40-49; 50-59; over 60), highest educational level (illiterate [r]; preschool; primary school or basic education (degree from the Literacy Movement Organization of Iran); pre- intermediate; intermediate; university or collage including theological college), activity status based on census classification (employed [r], have income but no job, housewife, student in school or college, unemployed or looking for job), have basic insurance (yes or no), have supplementary insurance (yes or no), have basic health insurance (yes or no) and household income. This last variable was categorized into five groups (less than 250,000 IRR; 250,000-500,000 IRR; 500,001-1,000,000 IRR; 1000,001-200,000 IRR; over 2,000,000 IRR), property ownership (owner, renter, other). During analysis a quartile was achieve by combining top two income groups.

Ethical Considerations

The stages of the IrMIDHS were approved by the Ethics Committee of Tehran University of Medical Sciences, the information office of the MoHME, the review of board of the Statistics Center of Iran and the Policy Council and Board of Deputies of the MoHME. More data about sampling data gathering and ethical issues regarding IrMIDHS are discussed comprehensively in the study protocol.

Statistical Analysis

The data was analyzed using statistical package for social sciences (SPSS Inc., Chicago, IL, USA) version 18.0 and stata.12 (1985-2011 LP STATA Corp, Texas, USA). The clustering effects were adjusted using Stata survey commands (svyset). The annual prevalence of RTAIs in general and among user subgroups (pedestrian, vehicle, motorcycle and other) are shown by socio-economic group. Bivariate and multivariable logistic regression models were developed to investigate the determinants of RTAIs in the population as a whole and among the road user subgroups. A p-value of less than 0.05 was considered to be statistically significant. The crude and adjusted odds ratios (AORs) and the 95% confidence interval (CI) were reported. Variables for which $p<0.2$ 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-responses.

Results

Of the 436 reported RTAIs in the IrMDHS study, 411 were entered into analysis after controlling the data. In the sample, 34 cases of RTADs were reported in the year leading up to the study. The mean age of victims of RTADs in the year leading up to the study was 36.17±15.23 years, of which 5.9% were female and 94.1% were male. The prevalence of disabilities caused by various types of road accidents for the year leading up to the study was 30.52 (95% CI: 21.13.41.64) per 100,000 individuals (Table 1).

The average age of those who were disabled in road accidents in the year leading up to the study was as pedestrians was 33.3±22.8, as automobile drivers was 32.5±14.5, as motorcyclists was 27.9±13.9. The proportion of disabilities per 1000 RTAIs was 22.11 (95% CI, 13.37, 30.75), 31.67 (95% CI; 8.51.54.97) per 10000 injured pedestrians, 20.99 (95% CI; 13.37, 30.75) per 1000 motorcycle drivers and 18.64 (95% CI; 7.71.29.57) per 1000 automobile drivers. The remainder were distributed among other road traffic accidents with vehicles such as carts, bicycles and tractors (Table 2).

The annual prevalence rate for males was 15.5 times more that of females (56.29 versus 3.67; $p=0.000$). The highest prevalence in terms of age was in the age group of 30-39 years ($p=0.080$) at a rate

Table 1. The prevalence of disabilities caused by various types of road accidents for the year leading up to the study.

variables	N (RTAs)	N (RTDs)	RTD rate (Recent year)			*p* value
			per1000 (RTIs)	CI (95%)		
Total	1538	34	22.11	13.37	30.75	
Pedestrian	221	7	31.67	8.51	54.94	0.648
Vehicle	590	11	18.64	7..71	29.57	
Motor Bicycle	667	14	20.99	10.09	31.88	
Other	60	2	33.3	4.06	115.315	

Table 2. Road Traffic Disabilities (RTIs) prevalence and associated socio-economic determinants among population and pedestrian, vehicle and motorbike user in Iran, IrMIDHS.2010

Variables	N	Per100000 population (Recent year)			*p* value	N	Per1000 RTA (Recent year)			*p* value
		Prevalence	CI (95%)				Prevalence	CI (95%)		
Total	111415	30.52	21.13	42.64		1538	22.11	13.37	30.75	0.518
Residency										
Rural	35534	33.77	17.45	58.98	0.670	494	24.29	12.61	42.05	0.689
Urban	75881	28.99	18.17	43.89		1044	21.07	13.25	31.73	
Sex							0	0	0	
Male	56849	56.29	38.51	79.45	0.000	1218	26.27	18.04	36.89	0.030
Female	54566	3.67	0.444	13.24		320	6.25	0.76	22.39	
Age										
0-9	17812	0	0	20.71*	0.080	102	0	0	35.50*	0.405
10-19	19518	15.37	3.17	44.91		270	11.11	2.3	32.13	
20-29	25021	43.96	21.95	78.65		487	22.59	11.33	40.05	
30-39	17741	50.73	23.2	96.28		290	31.03	14.29	58.09	
40-49	13084	30.57	8.33	78.26		180	22.22	6.09	55.92	
50-59	9224	43.37	11.82	110.99		124	32.26	8.86	80.53	
60<	9015	33.28	6.86	97.22		85	35.29	7.34	99.7	
Education										
Uneducated	15657	44.71	17.98	92.09	0.128	161	43.48	17.66	87.53	0.140
Pre school	1770	0	0	208.1*		15	0	0	21.80*	
Primary school &basic (Nehzat)	26745	26.17	10.52	53.92		301	23.26	9.4	47.33	
Pre intermediate	18492	54.08	25.94	99.43		346	28.9	13.94	52.51	
Intermediate(high school)	26269	38.07	18.26	70		489	28.9	13.94	52.51	
University & religious college	13138	0	0	28.27*		179	20.45	9.85	37.29	
Activity status										
Employed	30948	38.77	20.04	67.72	0.000	715	16.78	8.7	29.13	0.000
Have income no job	6228	48.17	9.93	140.71		85	35.29	7.34	99.7	
Housekeeper	27074	0	0	13.62*		156	0	0	23.30*	
Student(school or college)	10291	0	0	35.84*		169	0	0	21.50*	
Unemployed(look for job)	9485	168.69	96.45	273.79		235	68.09	39.41	108.2	
Basic insurance										
No	20394	34.32	13.8	70.71	0.732	343	20.41	8.24	41.59	0.805
Yes	90923	29.7	19.57	43.2		1193	22.63	14.97	32.76	
Supplement insurance										
No	97925	32.68	22.35	46.13	0.266	1360	23.53	16.15	33.06	0.294
Yes	13490	14.83	1.8	53.55		178	11.24	1.36	40	
Household income per month(IRR)										
Under 250000	31718	63.06	38.52	97.37	0.001	496	40.32	24.8	61.59	0.003
250000 - 500000	47986	20.84	9.99	38.32		650	15.38	7.4	28.11	
500000-1000000	18510	5.4	0.137	30.1		249	4.02	0.1	22.17	
Upper than1million	3236	0	0	113.9[a]		33	0	0	105[a]	

[a] one-sided, 97.5% confidence interval

of 50.73 (23.2.96.28) per 100000 individuals. The annual prevalence of RTADs in the unemployed was 168.69 (96.45; 273.79) per 100000, which is higher than for the other groups (p=0.000). The incidence of RTADs per 100000 decreased as the family income level increased from the lowest to the highest income group (p=0.001). The highest incidence rate of 63.06 (38.52, 97.37) was related to the lowest income group of (under 250,000 IRR: Table 1).

The results of bivariable and multivariable analysis are presented in Table 3. There are statistically significant associations between RTADs in the year leading up to the study for age 50-59 years old (AOR=10.78; 95% CI; 0.99, 116.78) in comparison with 0-9 years old, the unemployed (or looking for a job) (AOR=4.7; 95% CI; 2.06, 10.8) in comparison with those who were employed (as the reference group) and household income per month (IRR). There was an increasingly protective effect for 57% in the 250,000 to 500,000 IRR group (AOR=0.43;

Table 3. Bivariable and multivariable analyses of social determinant of Road Traffic Disability (RTDs) in Iran

Variables[a]	Disability caused by RTA (rtis)				
	Crude OR	Adjust			
		OR	CI (95%)		*p* value
Sex					
Male	1	1			
Female	0.23	0.69	0.14	3.27	0.637
Age					
0-9	1.00	empty			
10-19	0.31				
20-29	0.63	3.83	0.47	31.43	0.212
30-39	0.88	7.93	0.93	67.49	0.058
40-49	0.62	6.41	0.65	63.46	0.112
50-59	0.91	7.53	0.62	91.67	0.113
60<	1.00	2.67	0.18	38.75	0.473
Education					
Uneducated	1	1			
Pre school	1				
Primary school &basic(Nehzat)	0.52	0.75	0.20	2.88	0.679
Pre intermediate	0.65	0.82	0.22	3.15	0.778
Intermediate(high school)	0.46	0.72	0.18	2.82	0.634
University &religious college	1.00	1.00			
Activity status					
Employed	1	1			
Have income no job	2.14	2.63	0.62	11.26	0.192
Housekeeper	1.00				
Student(school or college)	1.00				
Unemployed(or look for job)	4.28	4.66	1.93	11.27	0.001
Household income per month(IRR)					
Under 250000	1	1			
250000-500000	0.37	0.42	0.17	1.02	0.056
500000-1000000	0.10	0.25	0.03	1.99	0.190
Upper than 1 million	1.00	1.00			

[a] OR with P>|z| less than 0.2 is omitted

95% CI; 0.19, 0.99) to 77% in the 500,000-1,000,000 IRR group (AOR=0.23; 95% CI; 0.02, 1.83) compared with those in the under 250,000 IRR reference group, who remained independently significantly associated with new cases of RTADs.

Discussion

The findings indicate that the prevalence of RTADs involving pedestrians is 1.7 and involving motorcyclists is 1.1 times higher than for those involving vehicle users. These two groups account for more than half of the RTAM deaths globally [17] which reflects the increased risk of severity of RTADs, but RTAs involving motorcyclists are more deadly than both [18, 19]. Studies in Iran have shown that, although the number of motorcyclists is less than the number of automobile drivers, the major percentage of mortality and morbidity was for motorcyclists, especially in rural areas. Gender differences also were observed in RTADs and indicate that the prevalence for males is 15.5 times that for females. This can be explained by the higher proportion of males in traffic accidents in general and their relative share of motorcyclists.

Studies in Iran show that high risk traffic behavior (not fastening seat belts, talking on mobile phones), which increases the risk of accidents are more common in males than females [20]. This difference in the prevalence of RTADs has a spatial aspect and in urban areas is 2.1 times higher than in urban areas (p=0.689). This finding can also be explained by increased vulnerability of rural areas to the consequences of RTAs, such as lower environmental quality (rural roads) and fewer facilities for treatment and pre-hospital services [21, 22] in the event of road accidents. These consequences vary from one victim to another, depending on the type and severity of the damage, the means of transportation and personal and environmental factors, such as age, gender, socioeconomic status and co-morbidity of RTAIs and other injuries. The risk of major functional and economic-social consequences of accidents increases as severity of the injuries increase [7].

The results of the 2010 census in Iran show a higher prevalence of disabilities (all types) for males and higher age groups [12]. In this study, the highest prevalence of RTADs by age was for the 30-39-year age group (p=0.080) with a rate of 50.73 (23.2.96.28) per 100000 individuals (p=0.000). A study in Spain

found a high prevalence of RTADs in individuals aged 31-64 years [23]. In addition to being more exposed to accidents, older individuals were more vulnerable and received less treatment [24, 25]. Global evidence and studies in Iran [26] indicates that, even for those who survive RTAs and suffer injury, the number of complications and disabilities increase as age increases [13].

Multivariate logistic regression analysis of the current data shows no significant difference in the risk of RTAD prevalence according to age group. The results of the present study were similar to the results of the World Disability Report 2012 that those with less education, the unemployed and those who have no insurance and lower earnings are included in vulnerable groups for RTADs [13]. A study conducted by Palmera-Suárez *et al*. in Spain reported a higher odds ratio for those with less education than those with medium education and those with lower incomes than those with higher incomes. In their study, only 27.7% of victims with disabilities who participated in the survey were fully employed [23].

One finding relates to the lower level of treatment and services after accident for such individuals compared with those with a better socioeconomic status. This can be explained by increased exposure to the risk of RTAIs because of their living conditions and higher risk environments [27-29] and increased severity of injury during transportation to a hospital [30] or a lack of post-treatment care [31]. They found that periodic (12 months) prevalence of RTADs in Iran was 30.52 (21.13, 42.64) per 100000 individuals. Few studies have examined the incidence and prevalence of RTDs globally. The WPP-adjusted incidence rate for RTAs in China in 2005 was 11.19 (95% CI; 11.13 to 11.25) per 100,000 individuals [3].

Iran has a high rate of accidents and health outcomes that create serious problems for the health system and society [35] and can lead to disability and death. Research has focused more on both sides of this spectrum and less attention has been paid to the RTADs. Further study can fill this gap and provide more evidence for policymakers for preventing and controlling these problems and reduce this inequality. One limitations of this study is the inadequacy of the sample size for sub national analysis, such as by province and in cities, to identify regional differences and consider limited analysis of disability, including evident and severe cases and the lack of questions about the consequences of these disabilities.

The rate of RTADs is an important indicator of the severity of such incidents and provides information for the assessment of temporary or permanent disabilities associated with accidents, loss of autonomy, individual developmental disruption, problems created for families and the social burden [11]. RTADs, in addition to the immediate physical and psychological effects such as pain, fatigue, mobility problems and problems with daily activities [13, 23] can cause depression, anxiety/fear, PTSD and other secondary socioeconomic effects. People with Disabilities (PWD) are marginalized, have more health problems and are less able to complete their education and compete economically and experience higher rates of poverty than those without disabilities [13]. Although disability can be related to a lack of facilities, this is not the same for all people with disabilities. For example, although females were a smaller percentage of RTADs, in most cases, they experienced increased discrimination related to their gender and disability. At present, our knowledge about these cases in Iran is incomplete and further data is needed from future studies.

This study has some limitations. First, more of the information was self-reported than in previous surveys. Although quality assurance measures were implemented to avoid the non-sampling errors, such as the use of control questions, some variable recall is possible. The data from all questionnaires were entered twice. The central team conducted a subsequent check of a random sample of the variables; therefore, this source of bias was reduced to a minimum. The external validity of the data conformed to a comparison of the age composition of IrMDHS and the national censuses and housing in 2006 and 2010 as well as for household size and literacy in both.

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