

## The effect of new road traffic laws on fatal and non-fatal injury rates in Iran

Elaheh Ainy<sup>1</sup>, Hamid Soori<sup>1\*</sup>, Seyed Mohammad Riahi<sup>2</sup>, Ebrahim Vahabzadeh<sup>3</sup>,  
Asghar Mohebi<sup>3</sup>, Masoud Amiri<sup>4</sup>

<sup>1</sup>Safety Promotion and Injury Prevention Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran; <sup>2</sup>Birjand University of medical sciences, Birjand, Iran; <sup>3</sup>Rahvar Research Center, NAJA, Iran; <sup>4</sup>Social Health Determinants Research Center, Shahrekord University of Medical Sciences, Shahrekord, Iran.

Received: 29/Jun/2014 Accepted: 23/Sep/2014

Original article

### ABSTRACT

**Background and aims:** This study aimed to evaluate the effect of enforcement of new traffic laws on the fatal and non-fatal injury rates in Iran.

**Methods:** In a longitudinal, interventional controlled trial study, all subjects with history of fatal and non-fatal injuries were studied. Their injuries were caused by six risky violations (unauthorized speed, illegal overtaking, red traffic light crossing, reverse gear movement in the highways, and vehicle arrestment due to two simultaneous violations) from June 2010 to November 2010 (as control) and from June 2011 to November 2011 (as case). Available forensic data were used and the outcome of new road traffic laws was analyzed.

**Results:** The new traffic laws led to reduction of fatal and non-fatal road traffic injuries in urban and metropolitan roads after implementation, with a continuing trend during six months. Reduction of fatal and non-fatal road traffic injuries was higher for 20-29 years age group. The effect of new traffic laws on reduction of fatal and non-fatal injuries was 8.7% and 33.3%, respectively. Reduction of fatality and injury rate at crash scene, after six months of intervention, was 0.4 and 11.1 per 100,000 populations, respectively.

**Conclusion:** The enforcement of the first phase of new traffic laws has reduced fatal and non-fatal rates of road traffic injuries in Iran. It seems that strict enforcement and amendment of new traffic regulations could further increase their efficiency.

**Keywords:** Law, Traffic, Urban and metropolitan roads, Injury, Iran.

### INTRODUCTION

Road traffic injuries are a major, but neglected, global public health problem. Traffic collisions are an important cause of death and disability worldwide; every year 1.2 million people are killed and up to 50 million are injured or disabled as a result of road traffic collisions around the world.<sup>1</sup>

Morbidity from road traffic collisions is expected to increase in future years, and estimated that its rank to rise from ninth to third place in the global burden of disease ranking, as measured in disability adjusted life years (DALY).<sup>2, 3</sup> Without increased efforts and new initiatives, the total number

\*Corresponding author: Safety Promotion and Injury Prevention Research Center, Shahid Beheshti University of Medical Sciences, Tehran, Iran, Tel: 00982122439980, E-mail:hsoori@yahoo.com.

of road traffic injuries and fatalities worldwide is forecast to rise by 65% between 2000 and 2020, while in low and middle-income countries, road traffic fatalities are expected to increase by as much as 80% within the same period.<sup>1</sup> A population-based study on deaths from injuries in Iran showed that in 2001 the death rate from road traffic injuries (RTIs) was 30 per 100,000 population and 131288 years of lost life, one of the highest rates worldwide.<sup>4</sup> In 2002, the number of deaths from RTIs, reported by Iranian Legal Medicine Organization, was 27,500. Expansion of industrialization and change of lifestyle seem to be more threatening than biological pathogenic to human health, leading to a transition of epidemiology. Evidences indicate that human behavior is the most common factor accounting for more than 85% of all traffic accidents<sup>1</sup>. A comprehensive study of road safety found that human error was the main cause in 57% of all accidents and a contributing factor in over 90%.<sup>5-8</sup> These factors included: driving behaviors (unauthorized speed, violation of traffic rules) and impaired driving (lack of concentration, fatigue and physical disability). Although reduction of human errors in traffic injury occurrence was considered in new traffic laws (fine increase in the cases of unauthorized speed, illegal overtaking, red traffic light crossing, the helix and reverse gear movement, and two simultaneous risky offences), the outcome of intervention has not been yet evaluated. The aim of this study was to compare the mortality and morbidity, six months prior to and six months after enforcement of new regulations, in order to determine the effect of intervention. Findings will partially represent new regulations' effect on mortality and morbidity, and which urban and metropolitan ways, which cities and which groups of drivers will be more affected by the intervention.

## METHODS

This study was longitudinal, interventional controlled trial. All subjects with history of fatal and non-fatal injuries caused by six risky violations (unauthorized speed, illegal overtaking, red traffic light crossing, helix movement, reverse gear movement in the highways, and vehicle arrestment due to two simultaneous violations) during the defined period of time (June 2010 to November 2010 as control and June 2011 to November 2011 as case groups) were studied. Available FAVA (data from Iranian traffic police information center) and forensic data were used and the effect of fatal and non-fatal factors associated with new laws was analyzed. Police data are collected regularly by the traffic police officers at the scene of traffic accidents using a checklist questionnaire and forensic data is registered for every fatal road traffic injury in death certificate. An injured person is defined as a person involved in a traffic crash who suffers non-fatal injury and/or injuries. A fatality is defined as a person involved in a traffic crash who dies either immediately or within 30 days due to the crash. Traffic crash was defined as a traffic collision that occurs on a public roadway that involves at least one motor vehicle (two, three, and four wheels) and results in death or injury to at least one involved person or property damage exceeding a specified monetary value. Data were transferred from Access to SPSS version 16. The effect of new traffic laws on mortality and morbidity six months prior and six months after intervention was analyzed using odds ratio (OR) and logistic regression. Based on the study design, using the formula below, attributable fraction risk in population was estimated:

$$\%AP_{\text{exp}} = \left( \frac{OR - 1.0}{OR} \right) \times 100$$

## RESULTS

A declining trend was obtained in the rates of fatal and non-fatal injuries, 0.4 (OR=0.9) and 11.1 (OR= 0.88) per 100,000

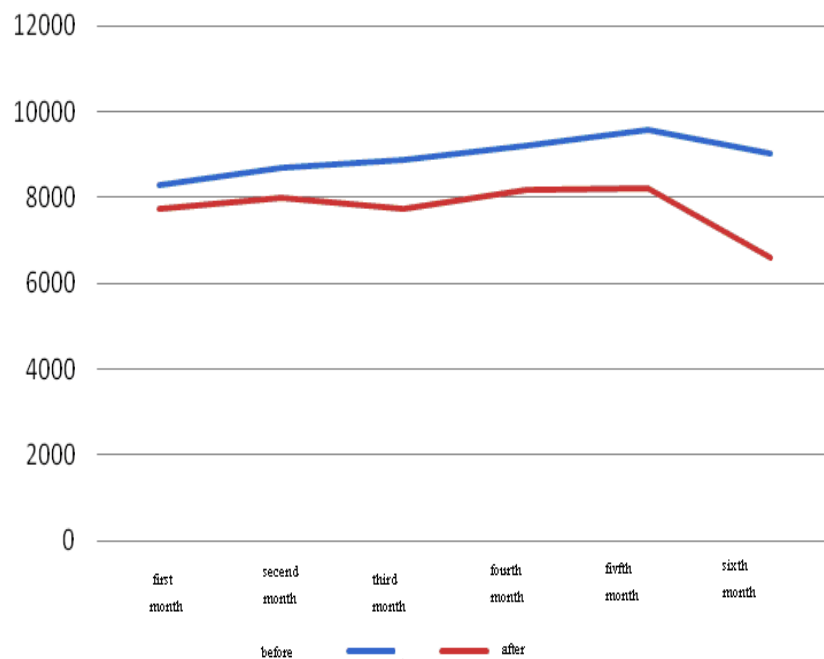
population respectively, during six months after the enforcement of new traffic laws (Table 1).

**Table 1:** Epidemiological indicators injury and death rates before and after new road traffic laws enforcement (phase 1)

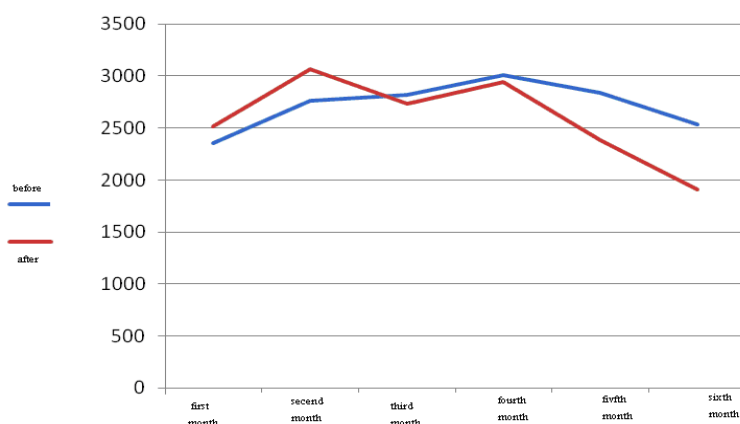
Titles	Before	After	Odds ratio	CI (95%)
Total Population	74733000	74961702		
Total crash scene death caused by road traffic injury during 6 months	3074	2801		
Total injuries caused by road traffic injury during 6 months	69992	62009		
Total crash scene death per (100,000) population during 6 months	4.1	3.7	0.9	0.86-0.95
Total injuries per (100,000) population during 6 months	93.7	82.8	0.88	0.87-0.89

Figures 1 and 2 show the comparison of road traffic injuries before and after the intervention in urban and metropolitan roads. Trend of injury showed a continuous reduction during six months of intervention. This reduction was noticeable in the sixth

month in urban roads (Figure 1). Figure 2 shows an increasing trend of road traffic injuries at the first month of intervention but this trend began to reduce during subsequent months particularly the sixth month (Figure 2).



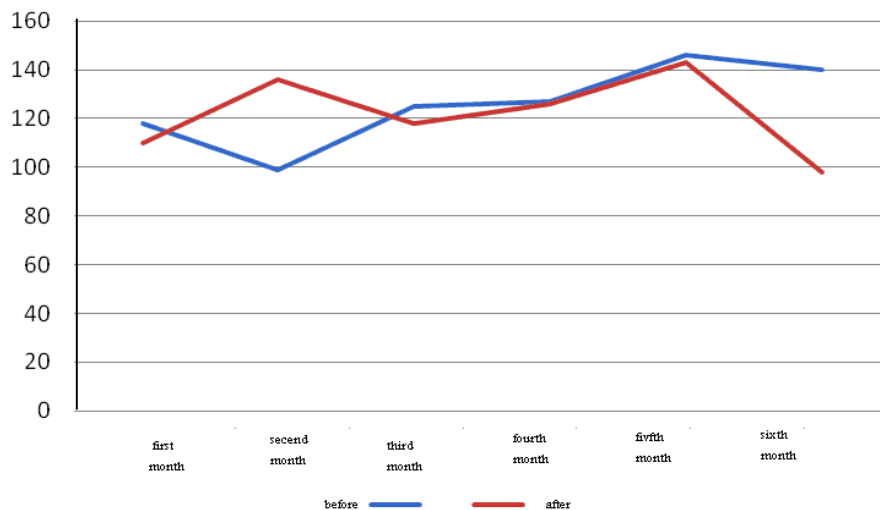
**Fig 1:** Comparison of urban road traffic injuries before and after intervention separation of the month



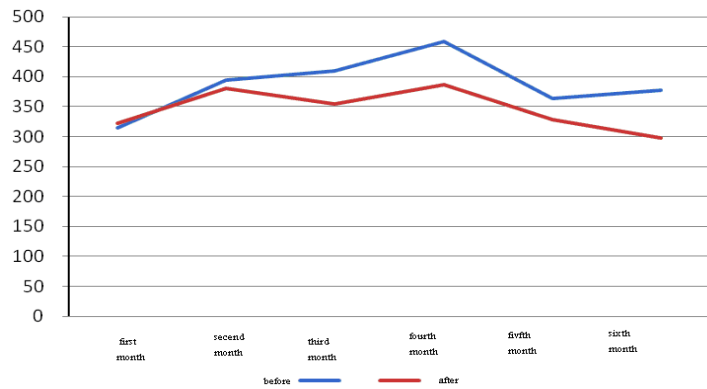
**Fig 2:** Comparison of metropolitan road traffic injuries before and after intervention separation of the month

Figures 3 and 4 show fatal injuries caused by road traffic accidents before and after the intervention in the metropolitan and urban roads. Figure 3 shows that fatal rate has increased two months after intervention, but this trend

began to reduce particularly in the sixth month (Figure 3). A decreasing trend of fatality was observed during six months of intervention in the metropolitan roads. This reduction was noticeable in the sixth month (Figure 4).



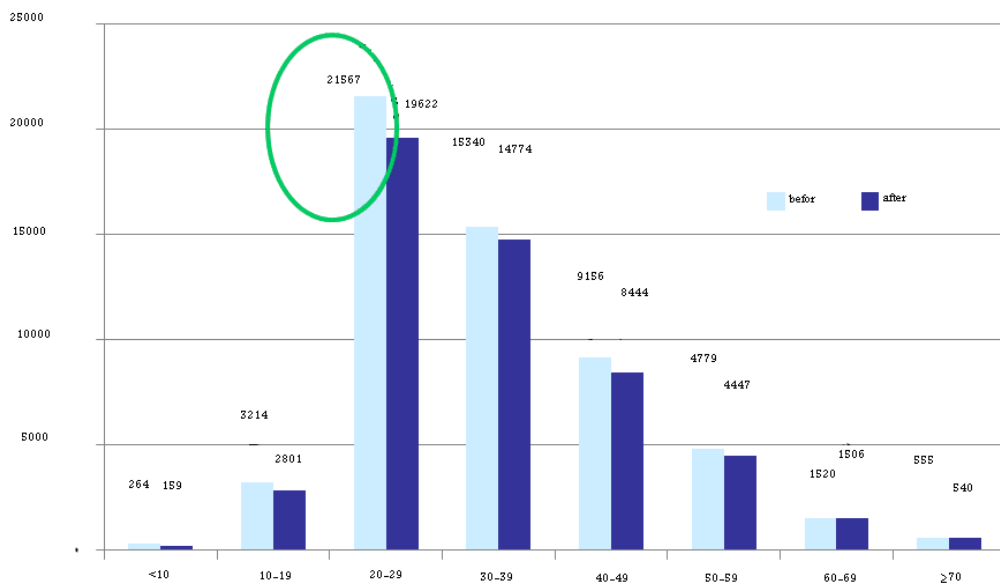
**Fig 3:** Comparison of urban road traffic crash scene fatality before and after intervention separation of the month



**Fig 4:** Comparison of the metropolitan road traffic crash scene fatality before and after intervention separation of the month

A declining trend of road traffic injuries was observed in all age groups after intervention. This

reduction was greater in 20-29 years age group than in other age groups (Figure 5).



**Fig 5:** Comparison of road traffic injuries among drivers before and after intervention based on age groups

Comparison of forensic law data showed fatality caused by road traffic injuries during seven months of intervention and the same period of the

previous year. The highest changes were observed in December and the lowest in September before and after intervention (Table 2).

**Table 2:** Comparison of forensic data of fatality caused by road traffic injuries

Months	Total Death 2010	Total Death 2011	Percent of changes
June	2037	1703	-16.4
July	2204	1968	-10.7
August	2333	2016	-13.6
September	2449	2163	-11.7
October	2271	2036	-10.3
November	2136	1740	-18.5
December	1957	1460	-25.4

Effects of new laws on road traffic injuries and fatalities are presented in Table 3. An estimation of attributable fraction risk

in population showed that new laws could decrease fatality and injuries by 8.7 % and 33.3 % respectively (Table 3).

**Table 3:** Results of logistic regression to determine effect of new laws at crash scene by fatal and non-fatal injuries

Variables	Grade	Reference Grade	OR	CI( 95 %)
Intervention ( Phase1)	Before	Reference Grade		
Death	After		92.0	87.0-97.0
Injury	After		75.0	74.0-76.0

## DISCUSSION

Findings revealed that new road traffic laws caused a decrease in rate of death and injuries at national level. Codification of new laws before and after implementation caused a decrease in rate of death and injuries in urban and metropolitan roads, with a continuing trend. Road traffic injuries' decrease was higher in young age groups than the other groups. Control and prevention of road traffic injuries are needed to identify related risk factors. Mao and colleagues showed that alcohol consumption by drivers, exceeding the speed limit, failure to use seat belt, throwing out of car after accident, bad weather condition, and face to face accident were associated with traffic accidents.<sup>9</sup> Other related factors which are reported as the reason for road traffic injuries occurrence are sleepiness of drivers during driving, male gender and older age, accident occurrence at crossing without

traffic control, bridge, tunnels, and snowing and icy road<sup>10</sup> Despite the fact that in Iran 70-80% of road traffic accidents caused by other vehicles, the car collision with natural and artificial objects along the roads was higher than other accidents.<sup>11</sup> All interventions have not led to road traffic injury decrease. A study evaluated the effect of fine increase on the number of injuries caused by road traffic accidents in motorcyclists, showing that the mean daily injuries referred to Avicenna hospital increased significantly in the first month of reorganization plan project compared with the previous month before intervention and the same month in the previous year. But incidence of severe, head and neck injuries decreased. Based on findings, it could be concluded that although reorganization plan project of motorcyclist traffic could not decrease the number of road traffic injuries,

the changes in pattern of incidence caused a decrease in severity of damage to face and head.<sup>12, 13</sup> In 1978, provisional certification for individuals aged 15-24 was started in New Zealand, for a two-year period, driving with a supervisor in the first six months, and restrictions on night driving and carrying passengers throughout the rest of period. This intervention caused road traffic injury decrease in young population, with a continuing trend over time.<sup>14</sup> Findings highlighted the decrease in the death and injury decreasing after new laws enforcement. Based on the forensic medicine reports, the highest percent of changes was observed in December and the lowest percent was observed in September before and after intervention. Forensic medicine reports showed that the intervention effect over time increased. Timely evaluation of the effect of new road traffic laws on the death and injuries at national level was the strength of this study. Evaluation is the most important part of interventional projects. The results showed a significant change in the rate of death and injuries at national level after enforcement of new road traffic laws, particularly in active age groups and positive effect of intervention, meaning decrease in death and disability and leading to macroeconomic benefits such as maintaining national, social, and mental capital. Enforcement of new road traffic laws is one of the fundamental measures to move toward a safe community which is undeniable right for every human and one of the major goals of World Health Organization. Lack of precise information related to some of participants increased missing values, which could be one of the weaknesses of the present study. Errors in information recording and potential failure of recording all deaths by traffic police experts could be noted. In the first phase, new road traffic laws have been able to decrease the rate of offences, deaths and

injuries and had positive effect. The decrease in the offences causing death and injuries was 8.7% and 33.3% respectively while the confounders were controlled. The new road traffic laws had a decreasing effect on road traffic injuries one to three months after implementation. The greatest reduction of injuries, death and offences was observed in active presence of traffic police at crash scene.

Among provinces where new road traffic laws did not have noticeable effect on death or injuries caused by road traffic accidents, it is necessary that reasons of failure be clarified precisely and potential obstacles be removed immediately. Using electronic devices could be effective on increasing enforcement of new road traffic laws particularly when police presence is low. Full and proper implementation of perseverance in the new laws could be effective in maintaining and increasing its effectiveness. Alongside enforcement of new road traffic laws, attention to safety promotion of vehicles, community education, promotion of drivers' safety behavior, road safety promotion and a comprehensive systemic approach to involving all stakeholders is necessary to reduce road traffic injury.

## **CONCLUSION**

The enforcement of the first phase of new traffic laws has reduced fatal and non-fatal rates of road traffic injuries in Iran. It seems that strict enforcement and amendment of new traffic regulations could further increase their efficiency.

## **CONFLICT OF INTEREST**

The authors declare that they have no conflict of interests.



## ACKNOWLEDGEMENTS

The authors express their gratitude to the information technology and planning unit personnel of the traffic police and legal medicine. This project was funded by the traffic police of Iran. This project was jointly conducted by Rahvar Research Center of NAJA and the Safety Promotion and Injury Prevention Research Center of Shahid Beheshti University of Medical Sciences.

## REFERENCES

1. World Health Organization. World report on road traffic injury prevention. Geneva: World Health Organization; 2004.
2. Murray CJ, Lopez AD. Alternative projections of mortality and disability by cause 1990-2020: Global Burden of Disease Study. *Lancet*. 1997; 349(9064): 1498-504.
3. Krug EG, Sharma GK, Lozano R. The global burden of injuries. *Am J Public Health*. 2000; 90(4): 523-6.
4. Akbari ME, Naghavi M, Soori H. Epidemiology of deaths from injuries in the Islamic Republic of Iran. *East Mediterr Health J*. 2006; 12(3-4): 382-90.
5. Treat JR, Tumbas NS, McDonald ST, Shiner D, Hume RD, Mayer RE, et al. Tri-level study of the causes of traffic accidents: final report. Indiana University: Institute for Research in Public Safety; NHTSA, 1973.
6. Lewin I. Driver training: a perceptual-motor skill approach. *Ergonomics*. 1982; 25(10): 917-24.
7. McFarland RA, Moore RC. Human factors in highway safety; a review and evaluation. *N Engl J Med*. 1957; 256(17): 792-8.
8. Evans L. A new traffic safety vision for the United States. *Am J Public Health*. 2003; 93(9): 1384-6.
9. Mao Y, Zhang J, Robbins G, Clarke K, Lam M, Pickett W. Factors affecting the severity of motor vehicle traffic crashes involving young drivers in Ontario. *Inj Prev*. 1997; 3(3): 183-9.
10. Zhang J, Lindsay J, Clarke K, Robbins G, Mao Y. Factors affecting the severity of motor vehicle traffic crashes involving elderly drivers in Ontario. *Accid Anal Prev*. 2000; 32(1): 117-25.
11. Khalaji K, MAjdzadeh R, Eshraghian M, Motevalian A, Holakouie Naieni K. Risk factors for Road Traffic Injuries on Qazvin- Loshan Road, 2005. *Iran J Epidemiol*. 2006; 2(1-2): 11-9.
12. McKnight AJ, Peck RC. Graduated driver licensing and safer driving. *J Safety Res*. 2003; 34(1): 85-9.
13. Younesian M, Moradi A, Khaji A, Mesdaghinia A, Zargar M. Evaluation of increasing penalty of motorcyclist on number of injuries caused by road traffic injuries. *J Iran Inst Health Sci Res: Payesh*. 2006; 6(1): 19-26.
14. Begg D, Stephenson S. Graduated driver licensing: the New Zealand experience. *J Safety Res*. 2003; 34(1): 99-105.

**How to cite the article:** Ainy E, Soori H, Riahi SM, Vahabzadeh M, Mohebi A, Amiri M. Effect of the new road traffic laws on fatal and non-fatal injury rates in Iran. *Int J Epidemiol Res*. 2014; 1 (1):16-23.