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The Role of Graduated Drivers' Licensing on Incidence and Severity of Road Traffic Injuries in Iran

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Authors' contributions

This work was carried out in collaboration between all authors. Author HS Prof, authors AN and EA contribute to project writing, data gathering monitoring, data analyze, preparing manuscript. Data sharing: Findings could be distributed by this journal to related sections. All authors read and approved the final manuscript.

Original Research Article

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ABSTRACT

Aims: This study investigated the role of graduated drivers licensing, implemented by the Traffic Police of Iran, on reducing the severity and incidence of road traffic injuries.
Study Design: It was an evaluation of the effectiveness of intervention by looking at the data before and after intervention.
Place and Duration of Study: Data on road traffic crashes and injuries from one year before, one year after and two years after the implementation of educated drivers licensing were obtained from Iran Traffic Police database in 2010.
Methodology: In this study the effectiveness of provisional license intervention by looking at the data before and after intervention was evaluated.
After data cleaning and stratification of traffic injuries and mortalities, the post-education records of drivers, in their early years of driving experience, were compared against their pre-education driving experience.
Results: Drivers under 23 years of age were involved in 22.8% of total road traffic injuries (RTIs) in the year prior to the implementation of graduated drivers licensing. This measure fell to 15.5% and 16.1% in the first and second years following the intervention among the

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holders of provisional B1 type driving license (p<0.001).
Conclusion: Intervention is an effective way of reducing the number and severity of traffic injuries, particularly among the young and novice drivers are at a greater risk of RTIs. Such drivers can particularly benefit from graduated drivers licensing program which is proven to reduce the incidence and severity of road traffic injuries.

Keywords: Traffic injuries; graduated drivers licensing; accident; transport; fatal.

1. INTRODUCTION

Road traffic injuries constitute a major cause of death and disability globally, with a disproportionate number occurring in developing countries. In 1998, developing countries accounted for more than 85% of all deaths due to road traffic crashes globally and for 96% of all children killed. Moreover, about 90% of disability-adjusted lives worldwide, due to road traffic injuries, occur in developing countries [1,2]. Meanwhile, human factors, according to some studies, have had the most influence on the occurrence of road traffic injury. These factors include drivers' behavior, high speed, violation of the traffic laws, insufficient driving skill, decentralization, fatigue, and physical disability [3]. Graduated drivers licensing is designed to delay full licensure while allowing teens to get their initial driving experience under low-risk conditions. It allows beginners to get their initial experience under controlled conditions with lower risk, while gradually exposing them to more complex driving conditions.

Educated drivers licensing was first proposed in the early 1970s by Waller in response to the over representation of young drivers in car crashes in North Carolina [4]. Graduated drivers' licensing framework included three stages. In the first stage, the learner period, all driving occurs under supervision. Given this period's relative safety, recent initiatives have tried to encourage the learner to experience a wide range of driving conditions as frequently as possible. In the second stage, the intermediate or provisional licensing period, driving is allowed without supervision. The third stage, full licensing, occurs when the first two stages have been completed [5]. *"A three-stage graduated driver licensing (GDL) system that applied to all new drivers aged 15–24 years was studied by Begg and Stephenson. Component of GDL were a 6-month learner license (supervised driving) and an 18-month restricted license stage (with restrictions on night driving and carrying passengers). Findings suggested that GDL restrictions had contributed to the reduction in crashes among young people and that it was not simply a case of reduced exposure to risk. This suggests that the impact of GDL has not diminished over time*" [6]. The impact of the new road traffic safety law in Serbia showed 26.5% reduction in road traffic fatality after intervention'' [7]. The study specifically investigated the role of educated drivers licensing in reducing the frequency and intensity of injuries (fatal or non-fatal) in Iran.

In this regard, the current study was conducted, as an external evaluation, to examine the level of success of the scheme (intervention) carried out by the Traffic Police in Iran.

2. MATERIALS AND METHODS

In this study the effectiveness of provisional license intervention by looking at the data before and after intervention was evaluated. Data on traffic accidents and injuries from one year before till two years after the implementation of educated drivers licensing (2004-2007) were obtained from the Center of Information and Communication Technology (ICT) of Traffic

Police Department of Iran, where the age of person to license is 18 years old. Provisional licensing law was performed by the Traffic Police as an educational program in Iran in 2005 in an attempt to reduce human error in driving. B1 driving license was issued for one year (provisional license= B1 license). In this period the driver is subjected to certain limitations under special conditions; the drivers are expected not to commit any offence for issues such as limited driving light, driving speed and alcohol consumption. If the driver does not commit any such offence for one year, following the initial license, he could receive a permanent license. Within one year of temporary license(graduated drivers licensing), if they have committed a great offence during mentioned period, this period will be extended for another year, otherwise ten years certificate will be granted after one year. The cut off point for the participants' age was 23. Accidents committed by drivers less than 23 years of age, during the law enforcement period, were included in B1 license records as interventional group; whereas accidents happening before the law enforcement act, by those more than 23 years of age, were included in type 2 driving license records as (control group, they have not had, a temporary license experienced).Cases that were injured or killed due to offensive drivers were excluded. After data cleaning and stratification of traffic injuries and mortalities, the data belonging to the implementation of graduated drivers licensing were compared with those belonging to drivers in their early years of driving experience. Chi square test was used to compare the accident ratio and fatal and non-fatal injuries happening prior to and after the implementation of educated drivers licensing in B1 and type 2 groups. The statistical packages used to analyze the data were SPSS (version 13) and STATA.

3. RESULTS

According to the results, the number of accidents dropped from a total of 71607 to 63642 cases in three years, i.e. from a year before and to two years after the implementation of educated drivers licensing. A significant reduction (7.0%) of accidents was observed in drivers under 23 years after the law enforcement ($p<0.001$, Table 1) policies.

Table 1. Frequency(%) of total accidents in inner and outer city roads, from a year before to two years after the implementation of temporary educated drivers licensing B1, based on driver's age and type of driving license

Time of law enforcement	B1 and type 2 driving license of those under 23 years			Type 2 driving license of those more than 23 years		
Temporary driving license	Inner city roads	Outer city roads	Total	Inner city roads	Outer city roads	Total
	Number (percent)			Number (percent)		
One year before enforcing temporary driving license	17708 (25.4)	3426 (15.0)	21134 (22.8)	52137 (74.06)	19470 (85)	71607 (77.2)
One year after the enforcement of temporary driving license	10231 (15.8) *	433 (13.3)	10664 (15.5)	54572 (84.02)	3401 (88.7)	57973 (84.5)
Two years after the enforcement of temporary driving license	12118 (16.2)**	126 (13.9)	12244 (16.1)	62864 (83.8)	778 (86.1)	63642 (83.9)
Total	20057 (19.1)	3985 (14.4)	44042 (18.6)	169573 (80.9)	23649 (85.6)	193222 (81.4)

**P< 0.001 Comparing data for one year and two years after the law enforcement policies; **numbers in parenthesis are presented in percent*

Further comparisons revealed a noticeable reduction in accidents committed by drivers with B1 and type 2 driving licenses (i.e. 12.7% and 13.4% decrease) during the first and second years after enforcing the law (p<0.001, Table 2).

Table 2. Frequency(%) of accidents from one year before to two years after the implementation of temporary educated drivers licensing B1, as measured by driver's offender for age and type of driving license

Time of implementing Temporary driving license	B1 and type 2 driving license of those under 23 years		Type 2 driving license of those more than 23 years	
	Offender	Non-offender	Offender	Non-offender
	Number (percent)		Number (percent)	
One year before enforcing temporary driving license	15021 (20.8)	6113 (30.0)**	57331 (79.2)	14275 (70.0)
One year after enforcing temporary driving license	7109 (12.7)*	3554 (27.6)	48671 (87.3)	9302 (72.4)
Two years after enforcing temporary driving license	8143 (13.4)	4101 (26.9)	52517 (86.6)	11125 (73.1)
Total	30273 (69.0)	13768 (31.0)	158519 (82.0)	34702 (18.0)

**P < 0.001 compares one year before and two years after enforcing the new regulations; **numbers in parenthesis are presented in percent*

There was also a significant reduction in fatal and non-fatal injuries in drivers under 23 years, following the enforcement of the law (p <0.001, Table 3).

Fatal injuries significantly varied according to sex of the drivers (4.2% males and 1.6% females) in the first and second years after the implementation of law enforcement policies (p <0.001, Table 4).

Table 3. Frequency(%) of total accidents in one year before to two years after temporary educated drivers licensing B1 based on driver's age, type of driving license and type of accident

Time of law enforcement for Temporary driving license	B1 and type 2 driving license of those under 23 years		Type 2 driving license of those more than 23 years	
	Non-fatal	Fatal	Non-fatal	¶Fatal
	Number (percent)		Number (percent)	
One year before enforcing the temporary driving license	19119 (25.4)*	1754 (13.3)*	58967 (75.5)	11377 (86.7)*
One year after enforcing temporary driving license	10119 (16.8)	444 (5.9)	50194 (83.2)	7123 (94.1)
Two years after enforcing temporary driving license	11321 (17.1)	808 (8.8)	54800 (82.9)	8354 (91.2)
Total	40559 (93.0)	3006 (7)	163961 (86.0)	26864 (14.0)

P < 0.001 compares one year before and two years after enforcing the new regulations;numbers in parenthesis are presented in percent*

Table 4. Frequency (%) of total accidents from one year before to two years after enforcing temporary educated drivers licensing B1, based on driver's age, sex and type of driving license

Time of law enforcement for temporary driving license	B1 and type 2 driving license of those under 23 years		Type 2 driving license of those more than 23 years	
	Female		Male	
	Non- fatal	Fatal	Non-fatal	Fatal
	Number (percent)		Number (percent)	
One year before enforcing the temporary driving license	520 (94.7)*	29 (5.3)	18570 (91.6)	1710 (8.4)
One year after enforcing temporary driving license	190 (93.1)	14 (6.9)	9916 (95.8)	431 (4.2) *
Two years after enforcing temporary driving license	312 (92.9)**	24 (7.1)	10993 (93.4)	783 (6.6)
Total	1022 (93.8)	67 (6.2)	39479 (93.1)	2924 (6.9)

**P < 0.001, Difference in injury reduction one year before, and one to two years after law enforcement, with gender matched; **numbers in parenthesis are presented in percent*

4. DISCUSSION

This study shows the noticeable effect of B1 type drivers licensing education in reducing traffic injuries. A significant reduction in accidents and fatal and non-fatal injuries was observed among drivers under 23 years after enforcement of the new regulations. Likewise, there was a significant reduction in accidents between drivers with B1 and those with type 2 driving licenses in the first and second year after the new law regulations. Rate of fatal injuries by sex in the first and second years after law enforcement policies showed significant differences between men and women drivers. In general, reduction in the number of injuries was apparently accounted for by two main reasons: reduction in risk factors and safer driving. Some major risk factors that were subjected to certain restrictions were as follows: Overnight traffic light, drivers' age and skill, driving speed and alcohol use. The risk of overnight poor light was removed by abandoning driving in poor light; this was quite significant as driving under inadequate light could cause fatigue as well; additionally very young or novice drivers were not allowed to drive; speeding restrictions and alcohol prohibition also helped to reduce the number of injuries. Safe driving the second major cause for fewer injuries mainly dealt with ways of encountering those violating driving regulations. For example driving license could just be issued for those who did not violate traffic (driving) rules. The results are in line with some studies like Hasselberg according to which, compared to control groups, in the experimental groups with parent accompanying their young children, the novice drivers underwent more restrictions [8].

Despite the new restrictions, some people were still likely to drive without having any driving license; this indicates the need for heavy presence of the Traffic Police on the one hand and introduction of driving tips on the other. Based on seven published evaluations, dealing with the impact of graduated licensing and driving restrictions on young driver crashes, educated drivers licensing reduced all types of crashes by 7% and injury crashes by 9%, with both reductions being statistically significant [9]. In line with such measures, driving license was issued in New Zealand in 1997 in three stages. In the first stage, after passing a theory test

and an eye sight check-up, novice drivers might drive with an observer in his 20s or more, with a two- year-old permanent driving license. This period would take nearly six months, after which a conditional driving license with 18 months duration would be issued. There were restrictions for driving at night; passenger under 20 years of age and those with blood alcohol levels up to 0.03 per 100 mg in this period were not allowed to drive. A permanent license would then be issued at the end of this period, after passing a driving exam. The intervention in New Zealand reduced injuries by 18% in five years. Of course this reduction implies a decrease in risk factors as well. According to a review of thirteen educated drivers licensing evaluations, carried out in the US, Canada, New Zealand and Australia, crash reduction among young first year drivers ranged from 26% to 41% [10]. In Frith's report, there were no significant differences in rate of injuries before and after law enforcement of temporary driving license [11]. Reduction of injuries after law enforcement might be due to fewer driving hours by those with a temporary driving license. To clarify the truth of this claim, the number of accidents per distance should have been calculated, but there was not any such information. To solve the problem, the driver might be forced to drive in the presence of an observer, within a certain time period. Before obtaining a permanent driving license, it would be an opportunity for the novice drivers to experience the traffic environment under a controlled condition. They would be able to gain some valuable experience in a difficult driving condition. Comparison of novice drivers, fewer than 20 years, with older ones indicated that the former had fewer accident risks, although they had less ability to evaluate such risks [12-14]. Begg findings showed the impact of graduated driver licensing has not diminished over time [6]. The impact of the new road traffic safety law in Serbia showed road traffic fatality reduction [7]. Antic finding showed" *new RTSL implementation in Belgrade and Serbia caused by the new legislation decrees and increased fines, in 2010 which was the first year of new RTSL implementation led to positive effects manifested by the previously described decrease in the number of traffic accidents casualties*" [15].Other studies, however, came to a different conclusion. Male young drivers caused more severe problems than female young drivers, indicating higher risk propensity in male drivers [16-19]. The number of fatality among males dropped from 1710 a year before to 431 and 783 during the first and second years after enforcing the law respectively. This feature among females was 29, 14 and 24 respectively. The number of non-fatality among males dropped from 18570 a year before to 9916 and 10993 during the first and second years after enforcing the law respectively. This feature among females was 520, 190 and 312 respectively. Overtime, effect of intervention was reduced in the second year after enforcing. Not permission to driving in outer city roads and risk taking behavior looked to be reason of high non fatal injuries among males. First year was baseline in the study. Overtime effect of intervention was reduced in the second years after enforcing.

One of the strengths of this study was the number of participants; it was the first study on this subject in Iran. However, the data collected by the Traffic Police at the scenes of accidents included a limited number of items, without going into details for closer look at the impact of intervention; so, as part of the weakness of this study, it is difficult to say how much of this reduction in injuries or fatalities is just due to the intervention. Further studies should be done to show the role of fatigue and lack of concentration on novice drivers with temporary driving license. Continuous assessment system for temporary driving license and restriction for novice drivers are recommended. It seems that the continuation of a conditional driving license, cancellation of driving credit of violators and inclusion of negative points for violators would be effective in preventing traffic injuries.

5. CONCLUSION

The efficiency of intervention in reducing the intensity of traffic injuries is well obvious; likewise, the benefits of educated drivers licensing in reducing the crude number of traffic injuries are well documented. Nonetheless, further interventions such as demerit points, license suspension and vehicle confiscation might also be implemented to prevent RTIs in long term.

CONSENT

All authors declare that 'written informed consent was obtained from the patient (or other approved parties) for publication of this case report and accompanying images.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the appropriate ethics committee and have therefore been performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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