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Rate and pattern of road traffic accidents among older and younger drivers

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Background: Driving mobility as an instrumental activity of daily living can maintain quality of life and prevent social isolation in old age. However, physiological and cognitive changes associated with aging cause driving skills that may increase the frequency and severity of traffic accidents among older drivers compared with their younger counterparts. Therefore, this study was conducted to compare the rate and pattern of road traffic accidents between older and younger drivers in Urmia City, West Azerbaijan Province, Iran.

Methods: The study used a cross-sectional retrospective design to obtain all road traffic accidents from March 21, 2014 to March 20, 2015 in Urmia City, West Azerbaijan Province, Iran. The relevant data were derived from Police traffic crash reports using a checklist developed by researchers. The descriptive and inferential statistics were conducted using SPSS version 23.

Results: A total of 2646 road traffic accidents were studied. The age of drivers ranged from 14 to 80 years. The mean age of older drivers was 68.79 (SD = 7.53). The rate of road traffic accident among older driver was found to be 8.1%. Older drivers compared with younger drivers, were more injured (37% vs. 16.8%). The results of a series of statistical analyses showed significant differences between older and younger drivers in patterns of road traffic accident.

Conclusion: The results of the present study suggest that driving in old age should be acknowledged as a public health concern. In addition, the findings showing different patterns of road traffic accidents between older and younger drivers imply that different prevention approaches are needed.

Keywords: Aging, Driving, Road traffic accident, Urmia

Driving is an important activity for the elderly as it maintain and improve their quality of life. At the same time, due to the reduction of perceptual, cognitive and motor abilities with age, driving performance may be impaired in old age[1–3]. Also, due to demographic changes and increasing aged population, it is estimated that the growth of aged drivers will be more than that of the aging community. Given the rising trend of aged drivers, it is predicted that road traffic accidents in the aging period increases[4]. Therefore, promoting safe driving among the elderly and studying related issues are considered an important research priority in gerontology[5]. Although the death rate of traffic accidents has fallen over the past decade, studies show that road traffic accidents and death rates in aged drivers have increased[1,3,6]. On the basis of the distance traveled, elderly people, especially after the age of 70 years, experience higher number of driving accidents and more death rates than other age groups, and this danger is more prevalent in old people with physical problems[5,7].

One of the solutions adopted to reduce the number of driving accidents is to limit and eventually stop driving at an advanced age. However, in doing so, one runs the risk of threatening the quality of life of the elderly. Outcomes in relation to ceasing driving include reduced motor activity of the elderly, reduced identity and increased dependency, depression, heart problems, fracture, stroke, death, reduced social integrity, and social support[4,8]. Stop driving makes many problems for the elderly and as a result, the elderly individual and his/her family come under pressure both psychologically and physically. In contrast, continued driving could increase the incidence of road accidents, and the families and close relatives of the aged people would not like to have their loved ones getting involved in accidents[9].

Increased driving problems among the elderly reduce their confidence. Consequently, they start developing self-regulating behaviors. For instance, they reduce the amount of driving and avoid driving at night. Studies showed that drivers of age 60 years and above, compared with other drivers, experience more driving accidents, and in most cases, they are the cause of the accident[2,9]. Keeping in mind the material available, the general lack of studies in Iran expressing statistics and detailed documentation concerning driving accidents in old age, and given the importance of driving among the elderly, the present study was conducted to compare the

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rate and pattern of road traffic accidents between older and younger drivers in Urmia City, West Azerbaijan Province, Iran.

Methods

The study used a cross-sectional retrospective design to obtain all road traffic accidents from March 21, 2014 to March 20, 2015 in Urmia City, West Azerbaijan Province, Iran. Urmia is the largest city in West Azerbaijan Province of Iran. According to the official census of 2011, her population was 667,499, of which 8.2% were 60 years and above. The relevant data were derived from Police traffic crash reports using a checklist developed by researchers. All traffic records were included in the study. Incomplete files that did not have the necessary information or files with a lack of transparency were excluded.

Sociodemographic data included sex, age, having legal driving license, vehicle type, and using helmet/belt. Accident time which reported in a 24-hour clock was divided into 4 hourly segments including morning, afternoon, evening, and night. Climate status was classified into 2 categories of good (clear) and bad (rainy or snowy). The car accident injury was gathered from police records and considered as injured or noninjured. Physical barriers such as ramps and humps in the roads that reported as cause of accident were extracted from police records.

Statistical analysis

Initially, the data were checked for missing and outliers data. The descriptive and inferential statistics using IBM SPSS version 23 were used to reach study purposes. A 2-tailed α value of 0.05 was considered as the level of statistical significance.

Results

The total number of subjects studied was 2646 including 214 who were aged 60 and above with an average age of 68.79 years and a SD of 7.53, and 2432 subjects who were under 60 years of age with an average age of 33.56 years and a SD of 10.63. Of the 2646 cases, 1776 involved personal vehicles (67.2%), 49 cases had to do with buses and minibuses (1.9%), 224 with motorcycles (8.5%), and 596 were other vehicle cases (22.5%). **Table 1** presents the characteristics of the studied sample.

Table 1

Characteristics of the sample.

		n (%)		
Variables	**Category**	**Young Drivers**	**Older Driver**	**Total**
Sex	Male	2150 (88.4)	169 (79)	2319 (87.6)
	Female	282 (11.6)	45 (21.0)	327 (12.4)
Driving license	Legal	2355 (96.8)	210 (98.1)	2565 (96.9)
	Illegal	58 (2.4)	2 (0.9)	60 (2.3)
	Expired	17 (0.7)	2 (0.9)	19 (0.7)
	Suspension	2 (0.1)	0 (0)	2 (0.1)
Vehicle type	Personal car	1632 (67.1)	145 (67.8)	1777 (67.2)
	Public vehicle	37 (1.5)	12 (5.6)	49 (1.9)
	Motorbike	214 (8.8)	10 (4.7)	224 (8.5)
	Others	549 (22.6)	47 (22)	596 (22.5)
Helmet, belt	Used	2209 (90.8)	204 (95.3)	2413 (91.2)
	Nonused	223 (9.2)	10 (4.7)	233 (8.8)

Among 2646 traffic accidents, 214 cases were people of the age of 60 years and above, which was 8.1% of the incidents. Of the 214 cases of traffic accidents involving people of 60 years of age and above, 63.6% were injured in the accident. About the time of the incident, 38.8% of accidents occurred in the morning (6 AM–12 PM), 37.9% in the afternoon (12–6 PM), 21% in the evening (from 6 PM to 12 AM in the evening), and 2.3% at night (12–6 AM). Among 2432 incidents involving people below 60 years of age, 16.8% were injured.

The pattern of road traffic accident

In this study, the pattern of road traffic accidents was operationally defined as injury, physical barriers, accident time, and climate status. The results of a series of χ^2 tests showed a significant difference between elderly and young drivers in terms of injury ($\chi^2_1 = 262.67$, $P < 0.001$), physical barriers ($\chi^2_1 = 5.62$, $P < 0.05$), accident time ($\chi^2_3 = 16.01$, $P < 0.01$), and climate status ($\chi^2_1 = 6.39$, $P < 0.05$). As shown in **Table 2**, elderly drivers had more injury and lower physical barriers compared with young drivers.

Discussion

This study has 2 main purposes. The first goal of the research was to determine the distribution traffic accidents involving both old and young drivers. The results of the research showed that 8.1% of accidents involved elderly drivers. Although the availability of the number of active drivers in each age group is necessary to calculate the traffic accident rate, no information was available about the percentage of old people having a driving license; the percentage of active drivers was estimated from other studies. According to other studies, about 5%–6% of active drivers of each community are aged drivers[10]. In the present study, it is observed that driving accidents involved older drivers are more than those of active older drivers. According to a study by National Highway Traffic Safety Administration (NHTSA), older drivers comprised 5% of all traffic accidents[11]. According to studies conducted in recent years, the researchers found that the number of accidents involving older drivers is higher than those involving younger drivers[9,10]. The reason is that in old age, the power of sight and hearing and the speed of motor responses

Table 2

Pattern of road traffic accident.

		n (%)		χ^2
Variables	**Category**	**Young Drivers**	**Aged Driver**	
Injury	Noninjured	2023 (83.2)	78 (36.4)	262.67***
	Injured	409 (16.8)	136 (63.6)	
Physical barriers	No	2156 (88.7)	201 (93.9)	5.62*
	Yes	276 (11.3)	13 (6.1)	
Accident time	Morning	675 (27.8)	83 (38.8)	16.01**
	Afternoon	946 (38.9)	81 (37.9)	
	Evening	660 (27.1)	45 (21.0)	
	Night	149 (6.1)	5 (2.3)	
Climate status	Good (clear)	2268 (93.3)	209 (97.7)	6.39*
	Bad (rainy or snowy)	164 (6.7)	5 (2.3)	

*$P \leq 0.05$.
**$P < 0.01$.
***$P < 0.001$.

decrease. Furthermore, some chronic diseases such as musculoskeletal problems and arthritis reduce the ability to drive safely. In addition, acute events such as heart or brain stroke may lead older drivers toward accidents.

The second purpose of this study was to describe the pattern of traffic accidents. In order to achieve this goal, the characteristics of traffic accidents for old and young drivers in the areas of injury at the scene of the incident, climate status, physical barriers, and the time of the accident were considered. The results of the study in the 4 areas are presented in **Table 2**.

The results of statistical tests showed that there is a significant difference between old and young drivers with respect to the amount of damage sustained after the accident. This means that injuries sustained by older drivers are significantly more than that of young drivers. More than 60% of older drivers at the place of accident were injured while just 16.8% of young drivers were injured at the area of the accident. The results of this research are consistent with many international studies, which show the extent of damage sustained by older drivers in the event of an accident is more[12–14]. This could be caused by medical problems, functional and cognitive impairment, delay in response time, decreased muscle and skeletal strength, or other items.

Another feature used to describe the pattern of traffic accidents in the old people was physical barriers in sight at the time of the accident. The results of the study showed that there is a significant difference between old and young drivers with regard to physical barriers in sight at the time of the accident. About 6% of older drivers stated that there has been a physical barrier in sight at the time of the incident. However, about 11% of young drivers mentioned physical barriers as the accident cause. It also seems that older drivers observe laws concerning driving at a safe speed more than the young ones. Therefore, despite the fact that they may face with physical barriers in their sight, but their observance of the safe speed laws may lead them to have lower accident rate than their younger counterparts.

In order to describe the pattern of traffic accidents of older drivers, another feature used was accident time. The results of the statistical analysis showed that there is a significant difference between old and nondrivers at the time of the accident. Accident time was classified into 4 groups: morning, afternoon, evening, and night. The results showed that accident rate in the morning was more in older drivers than younger drivers, and at other times, accident occurrence in the morning was less in older drivers than younger drivers. The results showed that the percentage of accidents among old people in the morning (6 AM–12 PM) was significantly more than that of young people probably because a large percentage of the old people consider the morning safer for driving, which leads to more use of personal vehicles and consequently higher accident rates. Another reason may be that young and middle-aged people use public vehicles more in the morning and this leads to high accident rates in the old people who use personal vehicles. The results of this study are consistent with some previous studies where they found that older drivers were more likely to be a part of collisions during the daytime[15–17].

Weather condition during accidents was used as another feature to describe the traffic accident pattern. The results of the study showed that there is a significant difference between old and young drivers in terms of weather conditions at the time of accident. A greater number of traffic accidents have been reported to occur among older drivers in clear weather compared with young drivers. Reports indicate that about 98% of accidents have occurred in clear air. However, about 93% of driving accidents for young drivers have occurred in clear air.

Current study results are in line with the studies of Fildes et al[15] and Lyman et al[17]. They found in separate studies that most traffic accidents in the old people happened in clear weather. This can be due to the fact that old people drive less when the weather is bad.

On the basis of the comparison of weather conditions and driving time on occurrence of accidents among the old and young drivers, the data from this study indicates that, contrary to what is believed, accident rate in adverse weather conditions and also at night in old people is less than young people. The reason for this contradiction is probably the behavior of avoiding of driving during unfavorable times and conditions. It seems that given their previous experience in relation to adverse weather conditions, older people avoid driving in these situations; this has led to the decreasing accident rate in those conditions.

In order to explain differences between older and younger drivers in the pattern of road traffic accidents, 2 theories namely Selection, Optimization, and Compensation (SOC) and Self-Regulation Theory (SRT) were used. On the basis of these theories, it can be explained why older adults compared with their younger counterparts may experience more road traffic accidents in the morning, the places with lower physical barriers and when the weather condition is clean. The SOC theory was provided by Napolitano, Freund, Baltes, and Carstensen[18,19]. According to the SOC, older adults may select a personal goal that brings positive impact to them. The theory has 3 dimensions of SOC. The selection dimension allows people to identify and achieve personal goals, for example, driving to meet their own mobility needs. Older adults select goals within current ability (eg, reducing driving or avoiding difficult driving situations). At the optimization level, elderly people would manage their driving performance, such as time allocation for driving. Therefore, older drivers try to use more time to reach the destination. On the basis of the third dimension of SOC theory, as the functional ability is not able to support continued driving, older drivers may use several compensation strategies such as restricting driving to situations where they feel confident and safe to maintain their driving performance. In addition, based on SRT, elderly people try to adjust their behavior in accordance with the conditions and changes in the external and internal environment. It enables individuals to self-regulate their behaviors over time and across changing circumstances to reach the goals[20]. On the basis of this theory, elderly drivers try to avoid driving in bad conditions such as unfamiliar areas and night[21]; however, due to the reduction of perceptual, cognitive and motor abilities with age, they will have traffic accidents.

Conclusions

The results of this study showed that 8.1% of traffic accidents are related to elderly drivers. That being said, 5%–6% of holders of the driving license are old people. It means that the probability of traffic accidents is higher among older drivers. Also, the probability of traffic accidents in good weather, daylight, and when physical barriers are in sight is less.

Although it is possible that there is more knowledge, experience, responsibility, and compliance with conditions in the older drivers than in young drivers, it seems that traffic accident probability is

more among the older drivers because of the reduction of cognitive processes and reduced timely response in them.

The first limitation that exists in this research is that data with respect to duration of driving and distance traveled before the accident were not available. Despite having a high volume of the sample, this study cannot be considered as a good proof for the old people population throughout the country. In other words, the results of the studied population cannot be generalized for the entire Iranian old people.

The most important limitation that should be acknowledged is the lack of information on denominators by age such as number of licensed drivers, driving activity or mileage driven, that. As older drivers are at greater risk for car accidents due to declining perceptual, cognitive, and motor abilities, some appropriate interventions such as physical interventions and perceptual training may improve driving performance of older drivers that consequently result in reducing the crash risk of older drivers. Moreover, modifying licensing requirements for older drivers may also result in reducing car accidents in old age.

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Conflicts of interest statement

The authors declare that there is no financial conflict of interest with regard to the content of this report.

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