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## Illicit Drug Abuse in Drivers of Motor Vehicle Collisions

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### Abstract

**Background:** Motor vehicle Traffic injuries are indeed one of the most important worldwide health problems. Opioids can induce a depressant effect on central nervous system which may increase the risk of traffic accidents. This cross-sectional case-control study was conducted in Marvdasht, Iran to investigate the presence of drugs in hospitalized non-fatally injured drivers of motor vehicles. **Materials and Methods:** Cases include 500 drivers of motor vehicles, injured in road traffic accidents and referred to the emergency ward. Controls were 500 patients hospitalized in the same emergency department due to non-traumatic reasons. They were asked about the abuse of any substance during the 72 hours before their referral to the hospital. Urinary samples of patients with negative history of drug consumption were analyzed. **Results:** Among drivers, 237 (47.4%) of case group and 278 (55.6%) of control group had positive-substance consumption. Opium was the common drug abused in both groups. An eight-fold increased risk of road accident was observed for drivers who had used tramadol (OR= 8.2, 95% CI 4.9-13.7, P<0.001). Two or more illicit drugs (poly drug abuse) were detected in 24% of cases and 31.8% of controls (50.6% and 57.2% of drug abusers, respectively). Just for tramadol, prevalence was higher in cases rather than controls. **Conclusion:** Results demonstrate a high proportion of illicit drug abuse among Iranian drivers. More health education and policies are necessary to steadily decrease drug abuse in our society. [GMJ. 2015;4(1):39-46]

**Keywords:** Traffic Accident; Non-fatal Driver; Drug Abuse

### Introduction

Motor vehicle Traffic injuries are indeed among most important worldwide health problems and the main referent cause of emergency departments. Drug abuse has increased throughout the world during last

decades [1]. Substance abuse can induce a depressant effect on central nervous system and may lead to impaired ability of driving by decreasing reflection and consciousness [2]. During past decades, many studies had focused on the risk of alcohol in traffic accidents but recently the role of drug besides alcohol is

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a topic of growing interest. In addition, some studies have shown that alcohol and/or drug consumption is correlated with increased traffic accidents risk [3-5].

Iran is geographically located near common centers of drug production, e.g. Afghanistan. So, despite government attempts, Iranian drivers' access to opium is relatively easy. This is the case especially for drivers of heavy vehicles [6].

Opium has always been the most frequently abused substances in Iran and like other countries, especially developing countries, its use is increasing in recent years. Official statistics show that opiate abuse in Iran is more than that of global average [7-10].

Some studies indicated that the pattern of drug abuse has changed in Iran. In the past, addicts widely used opium and nowadays this habit has shifted to the use of other drugs [7-9].

There are several published studies from different countries which have investigated the presence of drug and/or alcohol among drivers. These studies have been conducted using various methods of case selection and sample size. So, generalization is difficult. Most of them were conducted on killed drivers [11-13], some on fatal and non-fatal drivers [14], and rarely case-control studies [3]. Also, there are very few cases of control studies on non-fatally injured drivers [4, 5].

Nevertheless, relatively few substance use prevalence studies have been performed on Iranian drivers [15]. Obviously, more studies are necessary in this field to obtain adequate data for achieving health-related policies. So, this study was performed to investigate and compare the prevalence of drug abuse in two groups: 500 hospitalized non-fatally injured drivers of motor vehicles and 500 hospitalized non-injured drivers as controls.

### Materials and Methods

It was a cross-sectional and case-control study performed from the beginning of January to September 2012. Five hundred drivers of all kinds of motor vehicles, injured in road traffic accidents that were referred by emergency medical care system (115) or their family members to the emergency department of Martyr Motahari hospital were considered

as case group. They were compared to 500 patients (control group) who were hospitalized in the same emergency department due to non-traumatic reasons (i.e. cardiovascular disease, gynecology, stroke or respiratory diseases, etc.).

Inclusion criteria consisted of patients 18 years old or above (The lower age limit in Iran for driving is 18) and those who signed written informed consent forms. On the other hand, patients who were dead on arrival, non-driver patients (i.e. cases of pedestrian and passengers of automobiles), and patients with alcohol abuse were excluded from this study.

At first, they were followed to stabilize their vital signs (i.e. blood pressure, heart and respiratory rate). After hydration, oxygen therapy and fixation of fractures with splint, a history for substance consumption and demographic information (gender, age) was taken from patients or their attendants who filled informed consent form. Patients were ensured about the privacy of information. They were asked about abuse (IV injection, oral rout or inspiration) of any substance during the 72 hours before their referral to hospital.

Urinary samples of patients with negative history of drug consumption were analyzed in the laboratory of Marvdasht hospital. All morphine-codeine kits were purchased from an Iranian company confirmed by Iran Ministry of Health, Treatment and Education. At first, urine samples were collected under direct observation and then analyzed with strip rapid screen test. This test was designed to qualitatively detect opioid compounds in urine using anti-morphine monoclonal antibody. The lower limit of detection was 300ng/ml. A compound of Solid-Liquid column chromatography and Thin Layer Chromatography (TLC) was developed for positive screen test samples for confirmation and determination of opioid exact identity. This test has a high sensitivity and no drug interaction. In this study, urinary samples were not tested for the patients with positive history of drug abuse in both case and control groups. Severity of injury was assessed by Injury Severity Score (ISS). ISS less than 25, 25-50 and more than 50 was considered as mild, moderate and severe injury, respectively [16].

This study was approved by ethics committee of Trauma Research Center of Shiraz University of Medical Sciences. The informed consent was taken from patients. They volunteered to participate in the study and were ensured that information will remain confidential. A code was considered for each person. Data were analyzed using SPSS software for Windows (SPSS Inc., Chicago, Ill., USA). Statistical methods used included Chi-Square and Fisher's exact test to compare the prevalence of substance abuse between two groups. P-values less than 0.05 were considered statistically significant.

## Results

Age distribution of the cases and controls is shown in Table-1. Control group members were older than cases ( $p < 0.001$ ). The distribution of gender in both groups was similar and 70% of the subjects in the case group and 60% in the control were male ( $P = 0.138$ ).

Of 500 drivers, 237 (47.4%) in the case group abused illicit drugs. However, in the control group, 278 (55.6%) subjects showed positive-substance consumption. Therefore, the

prevalence of positive-substance abuse was significantly higher in the control group compared to the case group (OR=0.7, 95% CI 0.6-0.9,  $P = 0.009$ ).

The mean age of patients who abused illicit drugs in the case and control groups was 29.6 (SD=4.2) and 51.5 (SD=8.3) years old, respectively, and abusers in the control group were older than the cases ( $P = 0.001$ ). 211(89%) drivers abused substance in the case group and 195 (70.1%) in the control group were male.

In case group, severity of injury in drivers with positive drug abuse were mild, moderate, and severe in 191(80.6%), 33(13.9%), and 13 (5.5%), respectively.

Table-2 shows different types of substances used by subjects. Moreover, Figure-1 demonstrates it by age. The rate of cannabis abuse in the control group was significantly higher than that in the case group (19% and 8.2%, respectively, OR=0.4, 95% CI 0.2-0.6,  $P < 0.001$ ). Most of consumers were 35- 44 years old in the cases (16%) and 65-74 years in the controls (22.8%).

Although the prevalence of cocaine and crack abuse was higher in the cases, no significant differences were demonstrated among the case (2.25%) and control (1%) groups according to cocaine and crack abuse (OR=2.23, 95% CI 0.6-6.4,  $P = 0.13$ ). In addition, no subject used both cocaine and crack. All of the cases who abused cocaine or crack were less than 45 years of age.

Opium was the most substance abused in both control (49.4%) and case (30.8%) groups (OR=0.4, 95% CI 0.3-0.6,  $p < 0.001$ ). In the case group, the most percentage of opium use (46.9%) was presented in subjects who had 65 years of age or more.

**Table 1.** Distribution of Two Groups by Age

Age (year)	Case	Control
18-24	152	10
25-34	164	15
35-44	94	16
45-54	34	36
55-64	24	159
65-74	22	176
≥75	10	88

**Table 2.** Prevalence of Substance Abuse in Case and Control Groups

	Case	Control	P	OR(95% CI)
Cannabis	41(8.2)*	95(19)	<0.001	0.4(0.2-0.6)
Cocaine/ Crack	11(2.2)	5(1)	0.130	2.23(0.8-6.4)
Opium	154(30.8)	247(49.4)	<0.001	0.4(0.3-0.6)
Tramadol	117(23.4)	18(3.6)	<0.001	8.2(4.9-13.7)
Heroin	34(6.8)	72(14.4)	<0.001	0.4(0.3-0.7)
Any substance	237(47.4)	278(55.6)	0.009	0.7(0.6-0.9)

\* Values are N(%).

As seen in Figure-1, 8 out of 10 subjects (80%) who were above 75 years old abused opium. Moreover, heroin was detected in 6.8% of cases and 14.4% of controls. A significant difference was revealed between groups in heroin consumption (OR=0.4, 95%

CI 0.3-0.7,  $p < 0.001$ ). Heroin abuse in 45-54 year old cases (20.6%) and in 25-34 year old controls (40%) was more than those in other age groups.

In this study, 23.4% of cases and 3.6% of controls were positive for tramadol. A significant

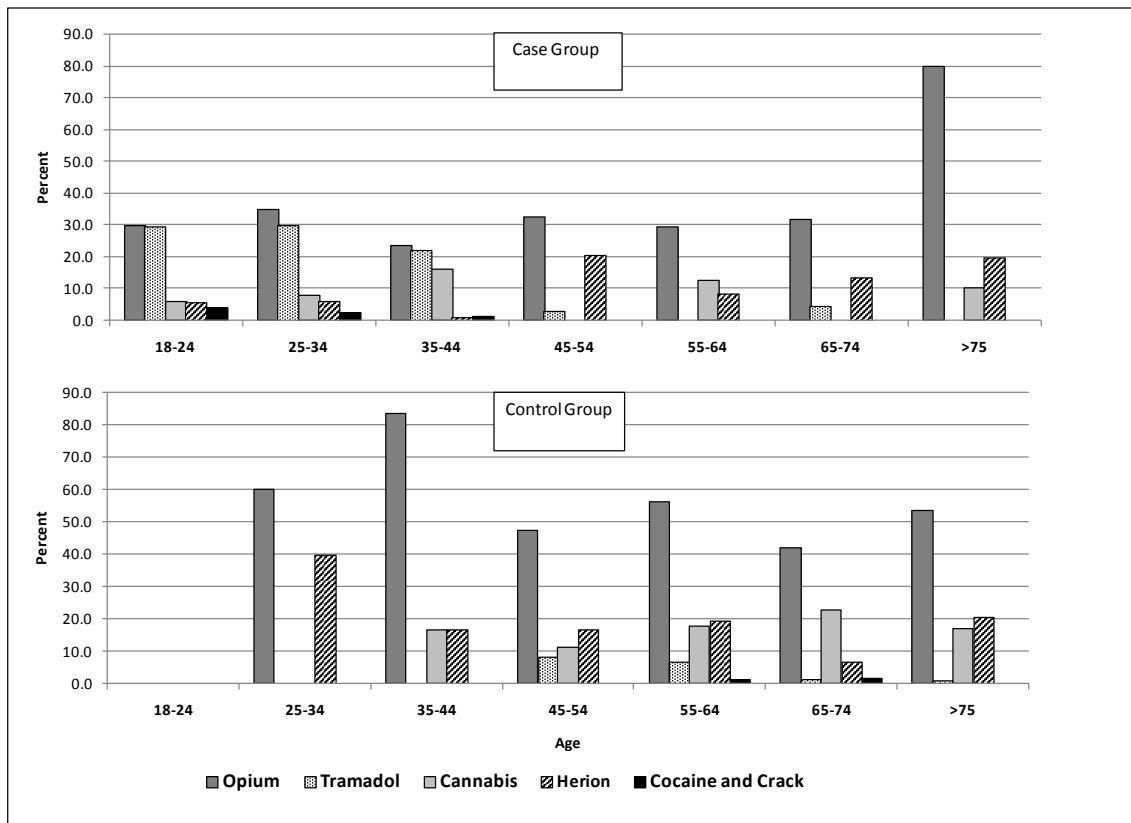


Figure 1. Substances Detected Among Case and Control Drivers According to Age

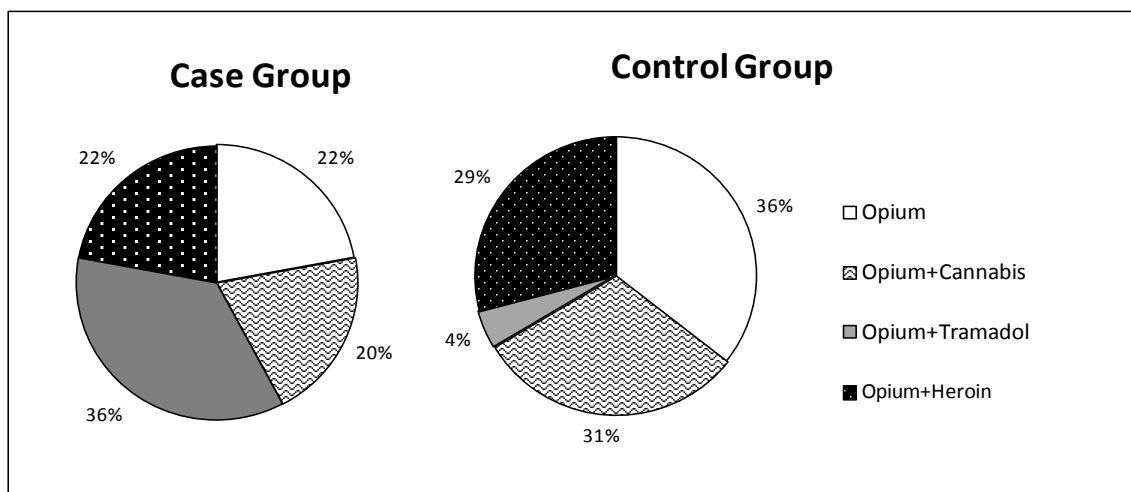


Figure 2. Combinations of Opium with Other Drugs

difference between case and control groups concerning the consumption of tramadol was demonstrated (OR=8.2, 95% CI 4.9-13.7,  $p<0.001$ ). Tramadol abusers were commonly in 18-24 (29.6%) and 25-34 (29.95) year old range among cases and in 45-54 year old ones among controls (8.3%). Two or more illicit drugs (poly drug abuse) were detected in 24% of the cases and 31.8% of the controls (50.6% and 57.2% of the drug abusers, respectively). Opium was one of the drugs abused among all poly-drug users (Figure-2).

## Discussion

The aim of this study was to assess the presence of drugs in hospitalized non-fatally injured drivers of motor vehicles. Study results indicated that prevalence of drug abuse is very high among Iranian drivers. Opium was the most frequently used illicit drug and tramadol increased the risk of traffic accidents.

In this study, controls were older than cases. About half of the controls were above 55 years of age although half of the cases were less than 35 years of age. This is consistent with previous studies in those admitted to emergency departments. They observed that about 60% of traffic accident traumas occur in 15-34 year old subjects [17] and people aged 60+ years often referred due to other reasons; only 32.4% were admitted for traffic accident injury [18]. It is obvious that appropriate functioning of human body decreases with age, so the number of elderly drivers who can drive reduces and the number of injured drivers due to traffic accident decreases.

In our study, most control subjects were transferred to emergency department due to geriatrics diseases. This is not an unusual phenomenon. 80% of the elderly people in Iran had one or more chronic diseases, mainly hypertension, cardiovascular, bone and joint diseases [19]. A positive relationship between chronic kidney disease and age has been observed in both males and females [20]. Besides, the prevalence of low back pain increased with age [21]. In this study, prevalence of drug among drivers was high. Different countries have reported very different percentages of drug abuse. Probably, the habits of abusers, the kind and frequency of drugs analyzed,

verification method (urine sample, blood sample, self-report, questionnaire or combination of these methods), or design of study were the reasons which made it difficult to compare the results of drug abuse. Just in India, a recent systematic review from 23 studies indicated that abuse of alcohol or drugs in injured drivers was 2%-33% and 6%-48% in drivers killed in a road crash [22]. Similar to our study, in a study conducted in the United States, about half of drivers were positive for drug abuse and no difference was found between those who were admitted to emergency ward for an accident and those admitted for other causes [23].

Similar to findings of other published studies, a majority of drivers who abused a substance were male [14, 24]. WHO reported most of drug users were male in Iran [9].

In contrast to our study, in many countries cannabis was the most frequently abused illicit drug among fatal and non-fatal drivers [14, 25]. In a case-control study in France, cannainoids was detected in 13.9% of drivers injured in traffic accidents and 7.5% of non-traumatic patients [26]. Some studies have shown that THC ( $\Delta^9\Delta^9$ -tetrahydrocannabinol, active substance of cannabis) abuse was not associated with the risk of road crashes [4]. In Luxembourg, cannabis was detected in 9.5% of drivers, all below 45 years old and most in 18-25 years old [24].

In our study, abuse of cocaine and crack is relatively much lower than other drugs. Probably, cost of drugs is the reason. Cocaine is expensive in Iran. Prevalence of cocaine and crack abuse as found in the present study is similar to Appenzeller *et al.* findings in which abuse rate of cocaine in drivers above 40 years was 1.4% [24]. In some studies, a higher percentage has been reported. In Spain, a study showed that the abuse of cocaine was found in about 4% of drivers involved in accidents [27]. Another study reported the percentage of 3.5% among drivers [28].

Although in our study no relationship between opium abuse and accident risk was found, this is in agreement with studies that indicated opium was the most frequently abused substance in Iran [9, 15]. Other countries had reported opioid abuse much less (<1%) among drivers [24].



A study found increased risk of traffic accidents under the influence of opium in regular users [29], but another one couldn't find any association between opiates use and culpability in drivers [3].

Heroin abuse was significantly higher among controls than cases. In a study in Iran, after opium (72%), the most common drug used among drug users was heroin (13%) [30].

The prevalence of tramadol is high in the cases. Tramadol is less expensive than other drugs detected in this study. An eight-fold increased risk of traffic accident was found in this study. However, tramadol is one of the most frequently abused drugs in other countries but prevalence is much less than that of our study. In a roadside study in Denmark, tramadol with the prevalence of 1.6% was the second legal drug frequently abused by drivers [32]. In addition, in seriously injured drivers, this prevalence was 3.2% and tramadol again had the second rank among drugs used [33]. In Switzerland, consumption of tramadol among divers suspected with drug abuse was less than 2% [34]. A study on trauma patients in Egypt showed that overdose of tramadol increased the risk of traffic accident [32].

More than half of drug abusing drivers in both groups consumed more than one drug. It seems that prevalence of poly-drug abuse among Iranian drivers is less than that by drivers in other countries. Many studies indicated that the majority of drivers with positive test of drug abuse use more than one substance [3, 24]. This prevalence in Scotland in blood and urine samples of drivers suspected with drug abuse was 68% and 90%, respectively [25].

To increase accuracy and precision in this study, we used two methods to detect drug abuse: history of drug abuse and urine test. This might cause a high drug abuse rate. Some studies showed that self-reports of drug abuse were more reliable than laboratory analysis which correlated to the time between crash and arrival to emergency center. Rajabizade et al indicated that 14.6% of drivers were addicted to morphine test but this prevalence rose to 26.5% through psychiatric interview [15].

The major limitation of this study was the small number of drivers in some age ranges that made it difficult to compare drug abusers in case and control age groups. Also, controls

were hospital patients and hospitalization is often related to drug use; another limitation of the study was the fact that controls were not drivers in random traffic. In our study, the control group was non-accident drivers hospitalized due to non-traumatic reasons. The advantage of this study is that controls were non-trauma drivers. We suggest further studies with controls, age-matched to cases rather than gender. Furthermore, a study on controls selected from moving traffic that are matched with cases according to location, day of the week, time of crashes, age and gender is suggested, or alternatively, in a study those factors can be adjusted in logistic regression analysis.

## Conclusion

Although this study did not find relationship between drug abuse and risk of traffic injuries, the prevalence was higher just for tramadol in drivers involved in road accidents than drivers transferred to emergency ward due to non-traumatic reasons. Therefore, tramadol increased the risk of traffic accidents.

Furthermore, our results confirm that opium continues to be the most illicit drug frequently consumed in Iran and demonstrate a high proportion of illicit drug abuse in Iranian drivers. In addition, this study indicated that most of drug abusers were male and more than half of drug abuser drivers consumed more than one drug. More health education and policies are necessary to steadily decrease drug abuse in the community.

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## Conflict of Interest

Authors declare that there is no conflict of interest.

## References

- Peden M, Scurfield R, Sleet D, Hyder AA, Jarawan E. World Report on Road Traffic Injuries Prevention. Geneva, Switzerland: World Health Organization; 2004.
- Vella-Brincat J, Macleod AD. Adverse effects of opioids on the central nervous systems of palliative care patients. *Journal of pain & palliative care pharmacotherapy*. 2007;21(1):15-25.
- Drummer OH, Gerostamoulos J, Batziris H, Chu M, Caplehorn J, Robertson MD, et al. The involvement of drugs in drivers of motor vehicles killed in Australian road traffic crashes. *Accident; analysis and prevention*. 2004;36(2):239-48.
- Mura P, Kintz P, Ludes B, Gaulier JM, Marquet P, Martin-Dupont S, et al. Comparison of the prevalence of alcohol, cannabis and other drugs between 900 injured drivers and 900 control subjects: results of a French collaborative study. *Forensic science international*. 2003;133(1-2):79-85.
- Movig KL, Mathijssen MP, Nagel PH, van Egmond T, de Gier JJ, Leufkens HG, et al. Psychoactive substance use and the risk of motor vehicle accidents. *Accident; analysis and prevention*. 2004;36(4):631-6.
- Agahi C, Spencer CP. Drug abuse in pre- and post-revolutionary Iran. *Journal of psychoactive drugs*. 1981;13(1):39-46.
- Alemi AA, Naraghi MM. The iceberg of opium addiction an epidemiological survey of opium addiction in a rural community. *Drug and alcohol dependence*. 1978;3(2):107-12.
- Ali R, Chiamwongpae S, Isfandari S, Jirammakoon S, Mardiati R, Murauskiene L, et al. The WHO collaborative study on substitution therapy of Opioid Dependence and HIV/AIDS. World Health Organization. 2005.
- World Health Organization. Best practice in HIV/AIDS prevention and care for injecting drug abusers: the Triangular Clinic in Kermanshah, Islamic Republic of Iran. WHO, Regional Office for the Eastern Mediterranean Cairo; 2004.
- United nations office on drugs and Crime. World Drug Report. Vienna, Austria; 2012.
- Ahlm K, Eriksson A. Driver's alcohol and passenger's death in motor vehicle crashes. *Traffic injury prevention*. 2006;7(3):219-23.
- Karjalainen K, Blencowe T, Lillsunde P. Substance use and social, health and safety-related factors among fatally injured drivers. *Accident; analysis and prevention*. 2012;45:731-6.
- Morland J, Steentoft A, Simonsen KW, Ojanpera I, Vuori E, Magnusdottir K, et al. Drugs related to motor vehicle crashes in northern European countries: a study of fatally injured drivers. *Accident; analysis and prevention*. 2011;43(6):1920-6.
- Ahlm K, Bjornstig U, Ostrom M. Alcohol and drugs in fatally and non-fatally injured motor vehicle drivers in northern Sweden. *Accident; analysis and prevention*. 2009;41(1):129-36.
- Rajabizade G, Ramezani MA, Shakibi MR. Prevalence of opium addiction in Iranian drivers 2001–2003. *Journal of medical sciences*. 2004;4(3):210-3.
- Baker SP, O'Neill B, Haddon W, Jr., Long WB. The injury severity score: a method for describing patients with multiple injuries and evaluating emergency care. *The Journal of trauma*. 1974;14(3):187-96.
- Farzandipour M, Ghattan H, Mazrouei L, Nejati M, Aghabagheri T. Epidemiological study of traumatic patients referred to neghavi hospital of kashan. *Journal of Kermanshah University of Medical Sciences*. 2007;11(1):58-68.
- Ansari-Moghaddam A, Martiniuk AL, Mohammadi M, Rad M, Sargazi F, Sheykhzadeh K, et al. The pattern of injury and poisoning in South East Iran. *BMC international health and human rights*. 2012;12:17.
- Sharif Zadeh GH, Moudi M, Founodi F. Health status of elderly people covered by the Relief Committee of Imam Khomeini. *Salmand*. 2006;17(5):52-9 [in Persian].
- Najafi I, Attari F, Islami F, Shakeri R, Malekzadeh F, Salahi R, et al. Renal function and risk factors of moderate to severe chronic kidney disease in Golestan Province, northeast of Iran. *PLoS one*. 2010;5(12):e14216.
- Biglarian A, Seifi B, Bakhshi E, Mohammad K, Rahgozar M, Karimlou M, et al. Low Back Pain Prevalence and Associated Factors in Iranian Population: Findings from the National Health Survey. *Pain research and treatment*. 2012;2012.

22. Das A, Gjerde H, Gopalan SS, Normann PT. Alcohol, drugs, and road traffic crashes in India: a systematic review. *Traffic injury prevention*. 2012;13(6):544-53.
23. Walsh JM, Flegel R, Atkins R, Cangianelli LA, Cooper C, Welsh C, et al. Drug and alcohol use among drivers admitted to a Level-1 trauma center. *Accident; analysis and prevention*. 2005;37(5):894-901.
24. Appenzeller BM, Schneider S, Yegles M, Maul A, Wennig R. Drugs and chronic alcohol abuse in drivers. *Forensic science international*. 2005;155(2-3):83-90.
25. Seymour A, Oliver JS. Role of drugs and alcohol in impaired drivers and fatally injured drivers in the Strathclyde police region of Scotland, 1995-1998. *Forensic science international*. 1999;103(2):89-100.
26. Marquet P, Delpla PA, Kerguelen S, Bremond J, Facy F, Garnier M, et al. Prevalence of drugs of abuse in urine of drivers involved in road accidents in France: a collaborative study. *Journal of forensic sciences*. 1998;43(4):806-11.
27. Kanaan A, Huertas P, Santiago A, Sanchez JA, Martinez P. Incidence of different health factors and their influence on traffic accidents in the province of Madrid, Spain. *Legal medicine (Tokyo, Japan)*. 2009;11 Suppl 1:S333-6.
28. Gomez-Talegon T, Fierro I, Gonzalez-Luque JC, Colas M, Lopez-Rivadulla M, Javier Alvarez F. Prevalence of psychoactive substances, alcohol, illicit drugs, and medicines, in Spanish drivers: a roadside study. *Forensic science international*. 2012;223(1-3):106-13.
29. Majdzadeh R, Feiz-Zadeh A, Rajabpour Z, Motevalian A, Hosseini M, Abdollahi M, et al. Opium consumption and the risk of traffic injuries in regular users: a case-crossover study in an emergency department. *Traffic injury prevention*. 2009;10(4):325-9.
30. Day C, Nassirimanesh B, Shakeshaft A, Dolan K. Patterns of drug use among a sample of drug users and injecting drug users attending a General Practice in Iran. *Harm reduction journal*. 2006;3:2.
31. Simonsen KW, Steentoft A, Hels T, Bernhoft IM, Rasmussen BS, Linnet K. Presence of psychoactive substances in oral fluid from randomly selected drivers in Denmark. *Forensic science international*. 2012;221(1-3):33-8.
32. Fawzi MM. Some medicolegal aspects concerning tramadol abuse: The new Middle East youth plague 2010. An Egyptian overview. *Egyptian Journal of Forensic Sciences*. 2011;1(2):99-102.
33. Simonsen KW, Steentoft A, Bernhoft IM, Hels T, Rasmussen BS, Linnet K. Psychoactive substances in seriously injured drivers in Denmark. *Forensic science international*. 2013;224(1-3):44-50.
34. Augsburg M, Donze N, Menetrey A, Brossard C, Sporkert F, Giroud C, et al. Concentration of drugs in blood of suspected impaired drivers. *Forensic science international*. 2005;153(1):11-5.