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Epidemiology of Alcohol Poisoning and Its Outcome in the North-West of Iran

Hamid Reza Morteza Bagi[1], Mohammad Tagizadieh[2], Payman Moharamzadeh[1], Mahboob Pouraghaei[1], Aynaz Kahvareh Barhagi[3], Kavous Shahsavari Nia[4*]

1. Department of Emergency medicine, Tabriz University of Medical Sciences, Tabriz, Iran.
2. Department of Pathalogy, Tabriz Branch, Islamic Azad University, Tabriz, Iran.
3. Department of Medicine, Islamic Azad University, Tabriz Branch Faculty of Medicine, Tabriz, Iran.
4. Road Traffic Injury Research Center, Tabriz University of Medical Sciences, Tabriz, Iran.

***Corresponding Author:** Kavous Shahsavari Nia; Road Traffic Injury Research Center, Tabriz University of Medical Sciences, Sina Hospital, Azadi Ave, Tabriz, Iran. Tel/Fax: +984115412101. Email: kavous.shahsavari@yahoo.com

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Abstract

Introduction: Alcohol poisoning is one of the main preventable causes of death, disability, and injury in many societies. Ethanol and methanol are the most prevalent kinds of alcohol used. There is no any exact reports of alcohol poisoning and its outcome in Iranian society. Therefore, the present study was assessed the status of alcohol poisoning and its outcome in referees to the emergency department. **Methods:** This is a cross-sectional study, which was done from July 2013 to 2014 in Sina Trauma Center, Tabriz, Iran. The studied population included all alcohol-poisoning cases referred to this center. Demographic variables, clinical evaluation, laboratory tests, and patient's outcome were evaluated. To assess the relation between evaluated factors and outcome of alcohol poisoning. After univariate analysis, a multivariate logistic regression was applied to evaluate independent risk factors for death. P<0.05 was considered as a significant level. **Results:** Lastly, 81 patients with alcohol poisoning were entered to the study (91.4% male) with the mean age of 27.9±10.4 years. Ten (12.3%) subjects were dialyzed and 34 (42%) cases hospitalized that 3 (3.7%) of them died. The multivariate logistic regression test displayed that plasma creatinine level (OR=2.2 95%Cl: 1.8-2.5; p=0.015) and need for dialysis (OR=6.4; 95%Cl: 5.3-7.5; p<0.001) were the only risk factors of death among these patients. **Conclusion:** The findings of the present study revealed that total mortality rate of referees to the emergency with alcohol poisoning was 3.7% all of whom related to methanol poisoning. Based on this result, the mortality rate of methanol poisoning was estimated 20%. Need for dialysis and increasing the creatinine level were accounted as independent risk factors of death.

Key words: Ethanol; methanol; alcohol drinking; alcoholism; poisoning; mortality

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Introduction:

Alcohol poisoning is one of the main preventable causes of death, disability, and injury in many societies. Alcohol consuming is together with adverse social consequences, which include liver cirrhosis, mental illness, several cancers, pancreatitis, and fetal damage in pregnant women. Also, alcohol consumption has a close relationship with social events such as drunk driving accidents, invasive and anti-social behaviors, family disruption, and dropping the individuals' performance (1-3). The prevalence of heavy alcohol use (at least 60 gram in each consumption) is variable in the world and reported as 7.5% in the general population (2). Although heavy drinking in Iran has been seen in less than 1% of alcoholics, it should be taken to account that most of alcohol consumption cases and their related outcome have not been reported because of the presence of social stigmas (4). Thus, it is probable that the alcohol use have a higher rate than this number. World health organization (WHO) has put effort to monitoring health status and providing technical assistance as well as cash and non-cash supports in its priorities to control health problems of alcohol abuse. One of the most important proceedings of WHO is encouraging to data gathering regards to gaps of statistics especially in developing countries. This organization has launched for technical helps to members with the aim of assessing, monitoring of health problems, as well as related process of alcohol consumption and its harm effects (5).

Ethanol and methanol are the most prevalent kinds of al-

cohol used. Ethanol consumption causes to sleep disorders, stomach diseases (gastric ulcer), esophagus and liver involvements, malnutrition, increasing the blood pressure and risk of heart and brain failures, myasthenia, auditory hallucinations, amnesia lasting, increasing the risk of head and neck cancer and gastrointestinal cancer (6, 7). Methanol consumption addition to all of these outcomes can also lead to blindness and even coma and death. Methanol is a toxic alcohol, which is used in many liquids such as antifreezes, solvents, glass cleaners, etc.; but the main source of its abuse is homemade alcohols. During the process of ethanol production some methanol is also produced which cannot be removed in these places (8).

In Iran because of religious issues and legal and social inhibitions, production and consumption of alcohol is illegal. This issue causes that most parts of alcohol abuse in Iran arise from homemade alcohols which in turn increase the probability of alcohol poisoning (9). In addition, fear of legal consequences causes that these cases often refer to health care centers after a long time. This causes that treatment proceedings would not effective enough and subsequently lead to a high rate of mortality from alcohol poisoning. However, in many of centers, the privacy of patients is kept secret and alcohol poisoning is not reported. Consequently, there is no any exact report of alcohol poisoning and its outcome in Iranian society. Therefore, the present study was assessed the status of alcohol poisoning and its outcome in referees to the emergency department.

Methods:

Study design and setting

This is a cross-sectional study, which was done in one-year period from July 2013 to 2014 in Sina Trauma Center, Tabriz, Iran. The main goal of this study was evaluating the alcohol poisoning and its consequences in admitted patients to the emergency department. This study was confirmed by Ethical Committee of Tabriz University of Medical Sciences. The subjects participated to the study as voluntary and consent forms were given from them.

Subject

The studied population included all alcohol-poisoning cases referred to the health centers. Exclusion criteria were dissatisfaction from participation to the study and disability of patients to answer the questions.

The strategy of determining the sample size was based on the studies with aim of assessing the frequency of an event. For this purpose and according to the previous studies, the prevalence of mortality in alcohol poisoning cases was estimated 28% (10). Thus with taking the type one error equal to 5% (α=0.05) and accuracy of 10% (d=0.1), the least numbers of needed sample for the project were 77 patients. Finally, 88 patients were evaluated.

Variables

Data of the present study was collected and registered in the checklist by a trained physician. Evaluated information included demographic variables (gender, age, occupation, location, and the way of referring), clinical evaluation, laboratory tests, and patient's outcome. The time interval from consumption to admission to the emergency, medical history, drug history, alcohol consumption history among family members, relatives and friends, intention of use (recreational, addiction, economic or social problems, curiosity), and clinical signs on arrival (drunkenness, lung problems, heart problems, loss of consciousness, blurred vision and blindness) were evaluated. In addition, laboratory assessment included hematologic and biochemical tests, arterial blood gases, and urine tests were recorded, too. In this part, white blood cell (WBC), hemoglobin concentration (Hb), and hematocrit level (Hct) were evaluated as hematologic assessment. The level of sodium (Na), potassium (K), blood urea nitrogen (BUN), creatinine (Cr), and blood sugar (BS) were also considered as biochemical tests. Furthermore, blood acidity (pH), bicarbonate (HCO_3), partial pressure of carbon dioxide ($PaCO_2$), chloride level, base excess, and anion gap in arterial blood gases were evaluated.

Evaluated outcomes

Primary outcome in the present study included need for dialysis, while secondary outcome contained with death of the patient and the occurrence of persistent symptoms.

Statistical analysis

Data were analyzed using STATA version 11.0. Quantitative data were reported as mean and standard deviation, qualitative data as frequency and percentage. To assess the relation between evaluated factors and outcome of alcohol poisoning, Mann-Whitney test (to compare quantitative and ordinal data), Chi-square test, and Fisher's exact test (for qualitative data) were used. To evaluate independent risk factors, a multivariate logistic regression was formulated to identify independent risk factors. In all analysis $p<0.05$ was considered as a significant level.

Results:

Finally, 81 patients with alcohol poisoning were entered to the study (91.4% male). The mean age of subjects was 27.9±10.4 years (range: 15-66). Forty-four (61.1%) patients were self-employed, 11 (15.2%) student, and 9 (12.5%) unemployed. Most of subjects were single (64.1%). Forty-three (68.2%) of cases had diploma and 10 (15.9%) were under diploma. Only 1 (1.2%) patient lived in the village. Forty-nine (62.8%) cases by their relatives and 23 (29.5%) by emergency medical system (EMS) were referred to the health care center. The mean of time interval between consumption to admission to the emergency ward was 7.8±16.4 hours (range: 1-96).

Table 1: The relationship between demographic and clinical factors with alcohol-related death

Evaluated factors	Patient's status		P*
	Dead	Alive	
Age (mean±SD)	6.7±24.3	10.5±28.0	
Gender			
Male	2 (2.7)	72 (90.3)	0.12
Female	1 (14.3)	6 (85.7)	
Occupation			
Self-employed	0 (0)	44 (100)	0.02
High school students	0 (0)	11 (100)	
Undergraduate students	1 (33.3)	2 (66.7)	
Employee	0 (0)	3 (100)	
Unemployed	1 (11.1)	8 (88.9)	
Prisoned	0 (0)	1 (100)	
The way of referring			
By self	0 (0)	3 (100)	
By relatives	1 (2.0)	48 (98.0)	
Ambulance	2 (8.7)	21 (91.3)	
Police	0 (0)	3 (100)	
Medical history			
Without history	3 (4.3)	67 (95.7)	0.99
Mental illness	0 (0)	2 (100)	
Hypotension	0 (0)	1 (100)	
Hypertension	0 (0)	2 (100)	
Migraine	0 (0)	1 (100)	
Asthma	0 (0)	1 (100)	
History of drug usage			
Without history	3 (4.3)	67 (95.7)	0.99
Cardiac	0 (0)	2 (100)	
Psychiatry	0 (0)	3 (100)	
Asthma	0 (0)	1 (100)	
Smoking	1 (2)	49 (98)	0.99
Drinking	2 (3.2)	61 (96.8)	0.5
Opium use	0 (0)	18 (100)	0.42
Symptoms			
Drunkenness	0 (0)	26 (100)	0.55
Lung problems	1 (33.3)	2 (66.7)	0.1
Heart problems	0 (0.0)	0 (0.0)	------
Loss of consciousness	2 (6.2)	30 (93.8)	0.56
Blurred vision	1 (3.4)	28 (96.6)	0.99
Blindness	0 (0.0)	0 (0.0)	------
Nausea and vomiting	2 (5.6)	33 (94.4)	0.58
Cause of use			
Recreational	2 (4.2)	46 (95.8)	0.99
Addiction	1 (7.7)	12 (92.1)	0.4
Economic problems	0 (0)	2 (100)	0.99
Social problems	0 (0)	8 (100)	0.99
Curiosity	0 (0)	1 (100)	0.42*

*Based on Fisher's test; SD: Standard deviation

In assessing of the medical history, 2 (2.6%) patients suffered from mental illness and 2 (2.6%) ones had hypertension. Also, 3 (4%) of them had a history of using psychiatric drugs and 2 (2.6%) cases had consumed cardiac drugs. The history of alcohol consumption in 63 (79.8%) patients was positive. Additionally, 50 (60.5%) patients had smoking history. Only 18 (22.5%) subjects had a history of using opium as orally or by smoking. History of alcohol consumption was reported in 1 (1.5%) case by father, 10 (12.4%) by brother, 2 (2.5%) by sister, 1

Table 2: The relation between hematologic and biochemical finding with alcohol-related death

Factor*	Patient's status		P**
	Alive	Dead	
Sodium (mEq/L)	140.3 (9.7)	136.3 (5.7)	0.2
Potassium (mEq/L)	4.0 (0.6)	4.6 (0.4)	0.04
Blood urea nitrogen (mg/dL)	29.2 (11.5)	51.3 (38.2)	0.3
Creatinine (mg/dL)	1.0 (0.9)	3.8 (3.6)	0.006
Blood sugar (mg/dL)	127.1 (61.3)	275 (206.4)	0.04
White blood cell (n/m3)	10001 (3802.7)	13750 (6717.5)	0.37
Hemoglobin (g/dL)	14.9 (4.5)	16.2 (2.4)	0.25
Hematocrit (%)	42.8 (6.6)	49.2 (3.2)	0.04
pH	7.28(0.2)	7.18 (0.12)	0.12
Bicarbonate (mEq/L)	21.1 (7.0)	16.6 (8.9)	0.37
$PaCO_2$ (mm Hg)	40.5 (10.6)	41.8 (16.2)	0.7
Chloride (mEq/L)	105.0 (8.3)	104.9 (5.1)	0.9
Base excess	-1.5 (6.7)	-10.1 (10.0)	0.11
Anion gap (mEq/L)	18.3 (13.3)	19.5 (16.1)	0.64

*Data was reported as mean (Standard deviation); **All P were based on Mann-Whitney test

Table 3: The independent risk factors of alcohol-related death

Factors	Odds ratio	95% confidence interval	P
Increasing the creatinine level	0.015	1.8-2.5	2.2
Need for dialysis	<0.001	5.3-7.5	6.4

(1.25%) by spouse, and 47 (58%) by friends. The reason of alcohol consumption in 48 (59.3%) subjects was recreational, 13 (16%) addiction, 8 (10%) social problems, and 2 (2.5%) economic problems. Nausea and vomiting were the most prevalent signs (44.4%). Moreover, drunkenness in 26 (32.5%), loss of consciousness in 32 (39.5%), blurred vision in 29 (35.8%), and lung problems in 3 (3.7%) patients were observed (Table 2). Finally, 10 (12.3%) subjects were dialyzed. Of 81 patients 34 (42%) cases were hospitalized that 3 (3.7%) of them died. The mean of patients' hospitalization was 1.4±2.7 days (range: 1-14). Three (3.7%) patients also had complication, one case had Wernicke-Korsakoff syndrome and metabolic encephalopathy, one blurred vision, and one optic neuropathy.

The relation between mortality and studied factors

The mean age of died patients was 24.3±6.7 years which had no significant difference with living ones (28±10.5 years) (p=0.69). In addition no significant relation was seen between gender (p=0.12), level of education (p=0.32), occupation (p=0.1), and the type of referring (p=0.4) with patients' death. Medical history (p=0.99), drug history (p=0.99), alcohol consumption history (p=0.5), time interval from consumption to admission (p=0.99), smoking (p=0.99), opium consumption (p=0.42) and its intention did not relate to patients' death, too. It is worth noting that none of symptoms had significant relationship with mortality of patients (Table 1). While, need for dialysis had a significant relation with mortality (p<0.001). Plasma sodium level (p=0.2), BUN (p=0.29), WBC (p=0.37), Hb (p=0.25), blood pH (p=0.12), bicarbonate (p=0.38), $PaCO_2$ (p=0.7), chloride (p=0.9), base excess (p=0.11), and anion gap (p=0.64) had no relation with death. On the other hand, increasing the potassium level (p=0.04), creatinine (p=0.006), BS (p=0.04), dialysis (p<0.001), and Hct (p=0.04) showed a significant relation with patients' mortality (Table2). The multivariate logistic regression displayed that plasma creatinine level (OR=2.2 95%Cl: 1.8-2.5; p=0.015) and need for dialysis (OR=6.4; 95%Cl: 5.3-7.5; p<0.001) were the only risk factors of death among these patients (Table 3).

Discussion

The findings of this study showed that the mortality rate of alcohol poisoning in the studied population was 3.7% of whom 12.3% needed to have dialysis. In addition, 3 (3.7%) patients had neurologic complications. Increasing the plasma creatinine level and need for dialysis were estimated as the only risk factors of alcohol poisoning related death. Mortality of alcohol poisoning has shown different rate among various studies which arises from differences in geographical regions, race, pattern of alcohol drinking, and type of alcohol. For example, WHO report in 2014 showed that globally in population over 15 years old, each person consumes in average about 6.2 liters alcohol annually. The prevalence of heavy drinking is high in Russia while in Scandinavian countries the least drinking has been seen. This reports has shown that alcohol drinking is cause of deaths in 5% of cancers, 5.8% of cardiovascular and diabetes diseases, 23.6% of

gastrointestinal disease, and 35.2% of accidents (15.2% unintentional and 20% intentional events). Totally, 5.9% of deaths are related to alcohol abuse (4). Moghaddam and Pajoumand stated that mortality rate of methanol poisoning was 48%; among survived persons 3 (23%) of them became blind and the rest discharged with full recovery. This study showed a significant relation between serum pH level and interval time between intake of methanol and admission with patients' death (11). The mortality rate in Shadnia et al. was reported 30% (10). Sanaee et al. declared 28% mortality in methanol poisoning, while Kute and colleagues showed 3.3% (12, 13). Additionally, in Ghannoum et al. study mortality of methanol and ethylene glycol were reported 2.9% and 2.4%, respectively (14). As can be seen, there are many differences among various studies. In the present study, mortality rate was estimated 3.7%. When patients with anion gap above 10 mEq per liter, osmolal gap above 11 mEq per liter, and metabolic acidosis (three signs of methanol poisoning) were separated from others, it was determined that 15 patients were suspicious for methanol poisoning. Three died patients were in this group, too. Based on above findings, mortality rate of methanol poisoning was 20%, near to the results of other studies.

Moreover, the findings of the present project showed that increasing the plasma creatinine level and need to have dialysis are the only risk factors of alcohol-related death. Whereas Shadnia et al. stated that coma, blood levels of methanol, $PaCO_2$, and BS are risk factors of death in these patients; in their research no relation was found between pH, bicarbonate, and time duration from poisoning to beginning the dialysis and death (10). Sanaee et al. showed that the only independent predictive factor of methanol-related death is hyperglycemia (12). But, study of Kute and colleagues presented that metabolic acidosis, need to use ventilator, and coma or seizure on admission are factors associated with mortality of methanol poisoning (13). As can be seen, there is a notable difference among studies in risk factors of death for alcohol poisoning cases. For instance, in some researches pH level was accounted, in others coma, etc. Therefore, presenting a total conclusion has not yet been possible in this area. It is suggested that in future studies evaluation of risk factors related to alcohol poisoning to be performed by using an acceptable volume sample with assessing all the possible effective factors.

Several strategies have been presented for controlling adverse effects of alcohol consumption. However, they should totally be performed to reduce the harmful effects of alcohol consumption and its related problems for both the person and society. These policies can be designed in the national, regional, and universal levels (15). These strategies can be involved in different aspects of production, sales, and management of consumers, which concluded accessibility to alcohol, the way of its selling, its price, drunk driving, preventive interventions, and therapy in the health care system. For this purpose, government pressures can be used as an efficient tool (16); say, Iran has executed strict laws regarding production as well as buy and sale of alcohol to prevent alcohol consumption. However, the present evidences revealed that these policies do not have appropriate preventive role. Indeed, for decreasing the destructive effects of alcohol consumption, governments should be aware from economic and social effects. Health system also has a critical role in confronting with problems related to alcohol by extending and providing health services for preventive goals. For instance, screening and brief intervention with referral to treatment could be representative the cost-effectiveness and usefulness of proceedings (17). To this end, the first step is increasing the capacity of health system and social welfare to present preventive, therapeutic, and care services regarding alcohol consumption (18, 19). Increasing the capacity includes alcohol cessation, creating a committee in the health ministry to control the alcohol abuse and holding training classes, improving the knowledge and attitude of the society to prevent alcohol consumption especially homemade products, and informing people from risks of alcohol abuse specifically methanol.

This is a cross- sectional study performed by questioning from patients or their relatives about patients' history. However, because of two reasons the bias cannot be ignored; first cause is arisen from observational studies that recall bias cannot be completely removed, and another one origins from social stigma against alcohol consuming in Iranian society. Based on these statements, the information about the history of alcohol consumption and other substance abuse with their cause of using may be not accurate enough. On the other hand, lacking of laboratory equipment to measure the blood methanol level caused that methanol poisoning could not exactly separated from ethanol poisoning.

Conclusion:

The findings of the present study revealed that total mortality rate of referees to the emergency with alcohol poisoning was 3.7% all of whom related to methanol poisoning. Based on this result, the mortality rate of methanol poisoning was estimated 20%. In addition, 12.3% of patients needed to have dialysis and 42% were hospitalized. It is worth noting that 3.7% of cases had neurologic complications. Need for dialysis and increasing the creatinine level were accounted as independent risk factors of death.

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Conflict of interest:

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