

A Survey on Substance Abuse Related Deaths Referred to Tehran's Legal Medicine Organization During 2007 and 2008

Hamid Reza Daneshparvar¹, Fariba Sardari², and Nasrin Esfahanizadeh³

¹ Department of the Research Center of Legal Medicine, Forensic Medicine Specialist, An Academic Member of the Training, Legal Medicine Organization, Tehran, Iran

² Laboratory Sciences and the Head Expert of Toxicology, Laboratory in the Legal Medicine Organization, Tehran, Iran

³ Islamic Azad University, Dental Branch, Tehran, Iran

Received: 29 Dec. 2009; Received in revised form: 13 Jul. 2010; Accepted: 29 Sep. 2010

Abstract- Doubtlessly one of the major problems in Iran is drug abuse or substance abuse. The transmission of HIV/AIDS has made the problem so complicated that has created an urgent need for a campaign against this awful phenomenon. The objective of this study-that was carried out through the cross-sectional method-is considering the situation of the addict death and the related factors. The target population consists of the corpses of the addicts referred to the Legal Medicine Organization of Tehran during 2007 and 2008. The cadavers were examined in the preliminary stage. The blood, urine and the contents of the gall-bladder, stomach and viscera were collected and sent to the toxicology laboratory to examine and find narcotics metabolites and other drugs. The samples of the brain, heart, lungs, liver and kidneys were sent to the pathology laboratories. All of the extracted data were recorded and analyzed using SPSS software. It was diagnosed that 248 cases (79.7%) out of the total 311 in this study, died of substance abuse. Totally 300 cases were reported as male addicts (96.5%). The oldest and youngest addicts were 49 and 17 respectively. The most frequent drugs used were heroin and combination of heroin and opium. No meaningful difference was observed between the death cause of different groups of drug abusers. It seems that the increase in the population of the substance users is the main cause of frequency changes of the addicts' deaths.

© 2011 Tehran University of Medical Sciences. All rights reserved.

Acta Medica Iranica 2011; 49(6): 383-389.

Keywords: Substance related disorders; Forensic medicine; Cadaver

Introduction

The substance or drug abuse is one of the important problems of the human beings in the Third Millennium the impact of which brings about devastating consequences for the individual and the society (1). The consequences especially regarding heroin and morphine, in addition to the known impacts, carry high risk diseases like HIV/AIDS and hepatitis that result in the death of the patient in the course of time (2). Among the important issues that have drawn the attention of the societies are the assessment of the death toll and investigation into the death causes of the addicts. Considering the widespread abuse of drugs and substances throughout the world and the policies to mitigate the impacts and injuries as the major solution for the health-based intervention of Iran Group, any information on the contributing and causative factors to

this population is of great importance. The periodical study on the addicts' death pattern in every country indicates the changes of the risky factors in that area.

The study on the causes and pattern of the addicts' death is based on two methodologies:

1. Prospective methodology: To follow-up the known addict cases and study on the causes and factors contributing to their death (3);
2. Retrospective Methodology: Based on the investigation on the deaths occurred in an area in a particular period of time (4,5).

Regarding the fact that the first methodology is based on a well-organized and regular registration system that is not available in Iran (at least respecting the addict population), the second cross-sectional method was selected to study the status-quo and also describe the outlook of the issue (6).

The project implementation brought about the

Corresponding Author: Hamid Reza Daneshparvar

Department of the Research Center of Legal, Forensic Medicine Specialist, An Academic Member of the Training, Medicine Organization, Tehran, Iran

Tel: +98 21 22586218, 912 1040616, Fax: +98 21 22587231, E-mail: hardanesh@yahoo.com

opportunity to get new information on the general condition of the under-study addicts' deaths as well as a whole estimation of the society. Learning about the existing situation, current issues and problems and deficiencies occurred throughout the project could be useful for the implementation of future supplementary projects (7).

Materials and Methods

The present project is a cross-sectional study and the statistical population consists of all addicts died of substance abuse that have been referred to the Central Legal Medicine Organization of Tehran (LMO) during a twelve-month period of time. Totally 311 cadavers were examined in the above-mentioned period. Inclusion criteria were: corpses referred to LMO, history of substance abuse according to records and relatives or friends or on the basis of general examinations and coroner's judgment. Exclusion criteria were: deaths due to accidents (car accidents, fall, burns, blunt or penetrating traumas due to fire arms or other weapons, asphyxia, immature newborn, drowning, electrocution) quarrels or murder.

Procedures of the project implementation

Each individual cadaver referred to the Legal Medicine Organization of Tehran during the above-mentioned period was examined concerning the inclusion criteria. Then the preliminary questionnaire was completed. The criteria of the study were as follows: drug addiction background according to the biography and description presented by the family members, close relatives and friends or available information and/or according to the medical examinations of the anatomy hall physician. Obviously, the accidents, murders and quarrels' victims were excluded. The preliminary questionnaire included the characteristics of the cadaver such as age, gender, place of referral, information on the addiction and quit background, any type of diseases, hospitalization, medical treatment, criminal record, marital status, employment record, education and place of residence. Then the autopsy was conducted on the cadaver and the findings of examination were registered. The required samples (the contents of the stomach, bladder, blood and gall-bladder) and (tissues of the lungs, liver, brain, heart and kidneys) were sent to the toxicology and pathology laboratories respectively. The toxicological samples were examined under routine tests both qualitatively and quantitatively for any sign of narcotic metabolisms like

opium, morphine, heroin, types of codeine and other substances such as benzodiazepines, barbiturates, phenothiazines, and anti-depression medicines. Routine laboratory methods included: 1) Liquid in liquid extraction using appropriate solvents such as chloroform in proper PH with both drugs, 2) Thin Layer Chromatography (TLC), 3) Chromatography using HPLC and GC/MS instruments. The results of the death cause for any individual deceased drug abuser (toxicology and pathology laboratories and the dead record) were put in the questionnaire and entered in the SPSS10.0 software. The quality control of the loaded and registered information was confirmed by the statistical and epidemiological consultants periodically.

Data collection method

- Questionnaire
- Interview with the close relatives
- In-depth review of the results of the autopsy and different forensic medicine examinations.

Data analysis method

The data entered into the computer software were evaluated through qualitative supervision. After the completion of the sampling procedures and laboratory results and finalizing the questionnaires the data were analyzed by using the dispersion indicators to describe the demographic characteristics of the deceased and the collected data. The sensitivity of different addiction diagnostic methods was compared with laboratory results and positive records. The relationship between pathological findings corresponding to the death cause and other clinical and laboratory findings and the deceased background were studied.

Results

Out of 311 cadavers studied, the death cause of 248 cases (79.7%) was drug/substance abuse. In 57 cases (18.3%) the death cause was not drug abuse and the death cause of 6 cases (1.9%) was unknown due to the lack of enough information;

300 (96.5%) of cases were male, 5 were female, and the gender of 6 cases (1.6%) was unknown due to the lack of accurate information. No meaningful difference was observed between death cause and gender type (by Fisher Exact Test: $P=1$);

The average age was 31.39 years old. The oldest deceased was 49, while the youngest was 17. The Std. Error was reported to be 0.46. The relationship between the age and death cause was tested by using T Test

method which showed no meaningful difference;

No meaningful relationship was observed between the death cause and education ($\chi^2= 2.63$, $df=5$, $P=0.756$);

No relationship between ethnicity and death cause was observed;

Regarding employment status, totally 163 cases (52.4%) were reported as employed, 86 cases (27.7%) jobless and 62 cases (19.9%) unknown. According to the computations no meaningful statistical difference was observed between the unemployed and employed groups;

Marital status was as follows: 141 cases (45.3%) were single, 81 cases (26%) married, 67 cases (21.5%) unknown, 21 cases (6.8%) divorced and 1 case (0.3%) spouse's decease. According to the statistical computations no meaningful difference was observed between the marital status and death cause;

A review on the place of residence and the death cause showed no relationship between the two variables;

Figure 1 shows the drug abuse record in the cadavers of the addicts who were studied in terms of the death cause.

Considering the causes of death, the history of substance abused was investigated. However, the history of abuse

of methadone, cannabis, psychedelic drugs, and other kinds of drugs was considered to belong to one group (other) and taken into account. In figure 1, Unknown means those cases where addiction was confirmed through history taking, but history or lab tests did not reveal the type of abuse drug(s).

The ways of drug abuse was also reviewed and divided into two injection and non-injection groups. The results are as follows:

a) 169 cases (54.3%) had somehow experienced injection,

b) No information was available regarding 75 cases (24.2%),

c) 67 cases (21.5%) had no injection experience and had used inhaling or smoking ways (or shared both ways). In autopsy examinations, of course, the organs were examined to find any injection signs as these findings were more reliable than the biography and background of the addicts. In 248 cases (79.8%) the injection sign was instinct on the bodies and in 63 cases (20.3%) no injection sign in the body was found. So, the clinical examinations and autopsy look more accurate and reliable;

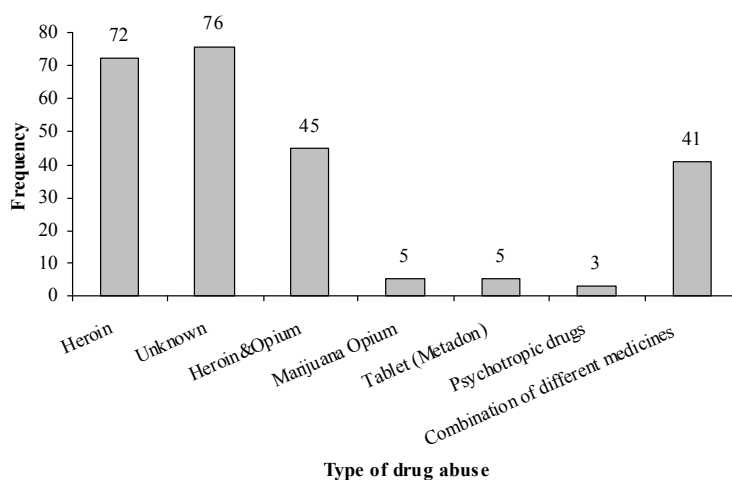


Figure 1. The drug abuse record in the cadavers of the addicts who were studied in terms of the death cause

Table 1. The results of toxicological tests on the samples of the addicts bodies, referred to the Tehran Legal Medicine Organization

	Result of test		
	Negative	Positive	
Urine	140 (45%)	171 (55%)	311 (100%)
gall bladder Contents	148 (47.6%)	163 (52.4%)	311 (100%)
Viscera	220 (70.7%)	91 (29.3%)	311 (100%)
Stomach contents	259 (83.3%)	52 (16.7%)	311 (100%)
Blood	288 (92.6%)	23 (7.4%)	311 (100%)

Table 2. The sensitivity and characteristics of narcotic metabolites test on any types of samples with compare of urine test

Type of sample	Characteristics	Sensitivity
gall bladder contents	63%	65%
Viscera	22.8%	34%
Stomach Contents	9.3%	22.8%
blood	7.8%	7%

The drug abuse duration before the death for 218 cases was reported by the companions. The duration average of drug abuse was 8.23 years (minimum 3 months and maximum 41.6 years);

According to the biography of the cases of research, 139 cases (44.7%) had criminal record and 79 cases (25.4%) had police clearance (without any criminal record), while there was no information regarding the record of 93 cases (29.9%). According to the statistical computations, there was a meaningful relationship between criminal record and drug abuse death;

Place of death: 117 cases (37.6%): house, 67 cases (21.5%) streets, 58 cases (18.3%) unknown, 18 cases (5.8%) other places.

The toxicological test of 242 cases (78.8%) out of 311 investigated cases was positive, and for 69 cases (22.2%) it was negative.

The results of toxicological tests on the samples of the addicts' bodies referred to the Tehran Legal Medicine Organization are shown in table 1.

In table 2 the sensitivity and characteristics of any sample has been regarded as positive first, if each TLC or HPLC tests under any conditions (acidic or alkaline or neutral) are positive and second, the comparison base (gold standard) with which other tests are compared is the urine test.

According to the pathological results of the brain tissues tests, 206 cases (66.2%) had afflicted Hypoxia and Ischemic Encephalopathy, 97 cases (31.2%) without any brain injuries and 8 cases (2.4%) had other tissue-related injuries;

According to the cardiac pathological results, 38 cases (12.2%) suffered from coronary artery blockage diseases, 4 cases (1.3%) from pericarditis, and 72 (23.1%) from other symptoms like coronary atherosclerosis, etc. and 197 cases (63.3%) had no signs and symptoms;

The average age of the samples according to the cardiac pathology is shown in table 3.

The average age in the group without any illnesses is the lowest.

Table 3. The average age of the samples according to cardiac pathology

Type of injury	Average age (Years)
Coronary artery diseases (heart blockage)	35.3
Other symptoms	33.7
Pericarditis	35.3
Without illness	29.7

The result of the one-sided variance analysis test showed that the average age of the group suffering from coronary artery (heart blockage) diseases and other symptoms has a meaningful statistical difference with the group without any illnesses ($P=0.000$ and $P=0.002$ respectively)

According to the pulmonary pathology 143 cases (46%) suffered from pneumonia (pulmonary infection), 113 cases (36.3%) from pulmonary edema along with other symptoms, 18 cases (5.8%) from other diseases and pulmonary symptoms and 37 cases (11.9%) were without any symptoms;

According to the results of hepatic pathology, 176 cases (56.6%) had hepatic cirrhosis, 1 case (0.03%) suffered from steatosis and 134 remaining cases (43.1%) had no symptoms. The interesting point here is that when the ratio of chance to get the hepatic diseases was considered in terms of the signs of drug injection in the cadavers, the result showed that the probability of positive pathological findings for the liver hepatitis in the injection addicts is 2.8 times higher than that of addicts without these signs.

According to the renal pathology, 251 cases (80.7%) had no illnesses, 36 cases (11.6%) suffered from ATN, 15 cases (4.8%) had nephrite... and 9 cases (2.9%) suffered from other renal illnesses.

Discussion

It was found that out of the total cadavers that were studied during a twelve- month period of time, drug/ substance abuse has been the death cause of 248 cases (79.7%); the death cause of 57 cases (18.3%) was not found to be drug abuse and for 6 cases (1.9%) the death cause has not been reported due to the lack of complete information. Out of the total cases, 300 were male addicts, 5 were female and the gender of 6 cases (1.6%) was unknown . The average age of the cases was 31.39 years old with the oldest addict of 49 years old and the youngest one of 17.

In a study carried out by Steentoft, *et al.*, the similar methodology was used. 15-17 percent of the deceased addicts of this study were female. The average age of the

narcotic use deaths in a similar study has been reported as 30-34 years old both in Denmark and Sweden, 35 in Norway and the same in Finland (8).

Copeland, *et al.* conducted a longitudinal and prospective study on 10 thousand of addicts in Scotland. The average death rate was 2.3%. Among those who survived, there seemed to be no meaningful difference with the dead ones from the gender point of view. The average age of the dead cases was 32.9 years old (9).

In a study carried out in Saudi Arabia in 1994 on 116 addicts who had referred to the clinical and rehabilitation centers, Hafiz found that the range of age was 21 to 32 years old. The above mentioned study addresses the live addicts (10).

The two first studies with different approaches have presented similar results concerning the data mentioned in the research that in turn shows the accuracy of the data and results on one hand. On the other hand despite the difference in the substance abusers gender, concerning the consequences and death no meaningful difference is observed.

Another important point in Iran is the age of starting and using narcotic drugs / substances. Concerning the average age of the dead addicts and addiction duration, it is obvious that the addicts, especially the injection group belong to under 30-years old population group who make the active population of the society.

The study showed that 12 cases (3.9%) of the addict population were illiterate, 70.9% were literate and the condition of 77 cases (25.2%) from the educational point of view was unknown. In Saudi Arabia 86 cases (74%) of the addicts had high-school education, 9.5% had post-secondary education and 16.5% were illiterate (10). The difference between literacy levels in the two studies may be related to the two countries' condition and educational programs, although both show a small number of illiterate addicts.

The study reports 163 cases (52.4%) employed addicts, 86 cases (27.7%) jobless ones and 62 cases (19.8%) with unknown employment condition. In the Saudi Arabian study 55 cases (47.4%) that referred to the centers are reported as employed (10). The fact that the percentage of the unemployed in this group of the society is higher than the total average could be of great importance. Comparing the average age of the dead addicts and the average age of marriage in Iran, it seems that the addict population consists of more single individuals. This may show a cause and effect relationship between marital status from one hand and narcotics and addiction from the other hand.

In their research on 5 countries Stentofí, *et al.*

concluded that the narcotic-driven death rate has decreased in the capital cities while increased in other regions of these countries (8). The present study has focused on Tehran, but the death rate inside Tehran and outside of it does not show much difference. However, a better judgment should be left for an all-inclusive and extensive study all over the country.

The type of the narcotic substance was considered according to the observations and the background of the addicts. The most frequent substance is heroin, and the shared use of heroin and opium. The second common substance is opium compared to other substances like a combination of different medicines, hashish, tablets and psychotropic drugs (11).

In the Saudi Arabian study, Hafiz found that 49.11% of the substance used was heroin and 34% heroin shared with other substances; 1 case of hashish use and in 26% of cases hashish shared with other substances and finally 10% of stimulating substances were reported (10).

In their study on 5 European countries Stentofí, *et al.* found heroin and morphine use as the major factors contributing to the death rate in these countries (12). The death rate of the above narcotics use amounted to 90% in Norway and 70% in Denmark and Sweden (13). The reminder 30% deaths in Denmark and Sweden were due to the use of Methadone and propoxyphen respectively (14). In this study Amphetamines and cocaine had little share in the death rate. In the countries selected for the study, the excessive drinking of alcohol and use of hashish and benzodiazepines especially diazepam are observed (8). Both studies related to the Mediterranean area had similar results concerning the type of substance used which goes back to the production and supply market and their prices that should be regarded as a document in different fields of planning.

Also the way of drug abuse plays an important role in the creation of the drug abuse impacts (15). Stentofí and his colleagues have approved that injection is the most common way of drug abuse (8).

In the present study the average duration of drug abuse has been 8.23 years. According to Hafiz study in Saudi Arabia, the average addiction duration of the study population has been 6.6 years (10). Copeland reported the duration average of addiction until the death time as 13.9 years (3). The assessment is conducted between the present and Copeland study as the Saudi Arabian study was carried out on the live addicts. It is evident that the addiction duration until the death time for Tehran study is 4 years less than the one for Scotland, about half of the time of drug abuse. So, more survey is required in this regard.

Results of narcotic metabolites in 78.7% of samples were positive; however, this ratio was different in the laboratory samples. The urine and gall bladder had the most positive and blood the less positive cases. The criteria for the comparison of computed sensitivity and characteristics, namely Gold Standard (16) are not ideal criteria and have been available for the best situation, but the differences could be cited and concluded. In other words, the samples of urine and gall bladder are adequate and precise enough to be used in such cases (17). Concerning cardiac pathology, 12.2% of the cases had artery coronary diseases and 23.1% had atherosclerosis along with other symptoms and 63.3% were without any signs and symptoms. A similar study has pointed more to the hypertrophy and atheromatous coronary injuries (18). The important point here is that the age average in the cases that had artery coronary (heart blockage) diseases is meaningfully more than those without any symptoms, but totally the average age of the cases with injuries (35.3 years old) is higher than the average age of the similar population in the normal society. The most serious pulmonary injuries were Pneumonia (46%) and pulmonary edema 36.3%. A similar study on the addicts' cadaver also reports pulmonary edema and pneumonia as the most serious injuries (19). The hepatic pathology in this group's cadaver indicates 56.6% cirrhosis and hepatitis. The chance of hepatitis affliction in the injection addicts is 2.83 times higher compared to the non-injection addicts. A similar study regarding the hepatic injuries had pointed to hepatitis and steatosis in the narcotic-driven deaths (20).

In conclusion, concerning the general objective of this study, namely a profile of general condition of the death of the drug/substance abusers and related factors, it seems that the situation in Iran is similar to the situation in other countries (21). Excluding some cases that require more studies, no special point regarding the contributing factors of the addicts' death was observed. The high death rate in such a cross-sectional study in comparison with other countries is due to the existing population outnumbering and the similarity of the patterns indicates that the death rate high frequency is due to the increase in the number of drug abusers.

References

1. Bjornaas MA, Bekken AS, Ojlert A, Haldorsen T, Jacobsen D, Rostrop M, Ekeberg O. A 20-year prospective study of mortality and causes of death among hospitalized opioid addicts in Oslo. *BMC Psychiatry* 2008;8:8.
2. Thiblin I, Eksborg S, Petersson A, Fugelstad A, Rajs J. Fatal intoxication as a consequence of intranasal administration (snorting) or pulmonary inhalation (smoking) of heroin. *Forensic Sci Int* 2004;139(2-3):241-7.
3. Copeland L, Budd J, Robertson JR, Elton RA. Changing patterns in causes of death in a cohort of injecting drug users, 1980-2001. *Arch Intern Med* 2004;164(11):1214-20.
4. Oyefeso A, Ghodse H, Clancy C, Corkery J, Goldfinch R. Drug abuse-related mortality: a study of teenage addicts over a 20-year period. *Soc Psychiatry Psychiatr Epidemiol* 1999;34(8):437-41.
5. Farrell M, Neeleman J, Griffiths P, Strang J. Suicide and overdose among opiate addicts. *Addiction* 1996;91(3):321-3.
6. Pedersen CL, Steentoft A, Kringsholm B. Deaths among drug addicts in Eastern Denmark 2005. *Ugeskr Laeger* 2008;170(50):4124-7.
7. Gossop M, Stewart D, Treacy S, Marsden J. A prospective study of mortality among drug misusers during a 4-year period after seeking treatment. *Addiction* 2002;97(1):39-47.
8. Steentoft A, Teige B, Ceder G, Vuori E, Kristinsson J, Simonsen KW, Holmgren P, Wethe G, Kaa E. Fatal poisoning in drug addicts in the Nordic countries. *Forensic Sci Int* 2001;123(1):63-9.
9. Pedersen CL, Steentoft A, Kringsholm B. Deaths among drug addicts in Eastern Denmark 2005. *Ugeskr Laeger* 2008;170(50):4124-7.
10. Hafeiz HB. Socio-demographic correlates and pattern of drug abuse in eastern Saudi Arabia. *Drug Alcohol Depend* 1995;38(3):255-9.
11. Steentoft A, Teige B, Holmgren P, Vuori E, Kristinsson J, Kaa E, Wethe G, Ceder G, Pikkarainen J, Simonsen KW. Drug addict deaths in the Nordic countries: a study based on medicolegally examined cases in the five Nordic countries in 1991. *Forensic Sci Int* 1996;77(1-2):109-18.
12. Morgan O, Vicente J, Griffiths P, Hickman M. Trends in overdose deaths from drug misuse in Europe: what do the data tell us? *Addiction* 2008;103(5):699-700.
13. Flanagan RJ, Fisher DS. Volatile substance abuse and crime: data from U.K. press cuttings 1996-2007. *Med Sci Law* 2008;48(4):295-306.
14. Steentoft A, Linnet K. Blood concentrations of clonazepam and 7-aminoclonazepam in forensic cases in Denmark for the period 2002-2007. *Forensic Sci Int* 2009;184(1-3):74-9.
15. McGinnis JM, Foege WH. Mortality and morbidity attributable to use of addictive substances in the United States. *Proc Assoc Am Physicians* 1999;111(2):109-18.
16. Chen CC, Kuo CJ, Tsai SY. Causes of death of patients with substance dependence: a record-linkage study in a psychiatric hospital in Taiwan. *Addiction* 2001;96(5):729-36.
17. Quaglio G, Talamini G, Lechi A, Venturini L, Lugoboni F,

- Mezzelani P. Gruppo Intersert di Collaborazione Scientifica (GICS). Study of 2708 heroin-related deaths in north-eastern Italy 1985-98 to establish the main causes of death. *Addiction* 2001;96(8):1127-37.
18. Bloor M, Gannon M, Hay G, Jackson G, Leyland AH, McKeganey N. Contribution of problem drug users' deaths to excess mortality in Scotland: secondary analysis of cohort study. *BMJ* 2008;337:a478. doi: 10.1136/bmj.a478.
19. Milloy MJ, Kerr T, Tyndall M, Montaner J, Wood E. Estimated drug overdose deaths averted by North America's first medically-supervised safer injection facility. *PLoS One* 2008;3(10):e3351.
20. King R, Bird SM, Hay G, Hutchinson SJ. Estimating current injectors in Scotland and their drug-related death rate by sex, region and age-group via Bayesian capture: recapture methods. *Stat Methods Med Res* 2009;18(4):341-59.
21. Sutlović D, Definis-Gojanović M. Fatal poisoning by alcohol and heroin. *Arh Hig Rada Toksikol* 2007;58(3):323-8.