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Evaluation of some abuse drugs in Patients of an Emergency Hospital

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Abstract

Drugs have played a major role in defining the sub cultural and counter cultural influences in society. The pervasive availability of psychotropic chemicals can cause a direct physiological and psychological change in the body. The present work is aimed to use laboratory based analyses to determine the prevalence and use pattern of some substances of abuse among a group of acute overdosed patients. The study was conducted on patients (n=390) with acute poisoning by some drugs of abuse (Cannabis, benzodiazepines, barbiturates, opiates and ethanol).The patients were from Dakahlia governorate and surrounding governorates. They were admitted to poison unit, emergency hospital, Mansoura University in the period between November 2009 and April 2014. In this study all patients were subjected for detection of drugs of abuse in urine by EMIT system and Gas Chromatography / Mass Spectrometry (GC/MS) for confirmation of the obtained results. The study showed that approximately 75% of patients were encountered in the age group 20–40 years. Cannabis was the first abused drug (37.69%) followed by opioids (27.18%). Female patients were likely to abuse benzodiazepines (57.14%). The study revealed that the percentages of positive urine samples by EMIT were; (27.18%, 14.87%, 11.54% 9.74% and 1.79%), for cannabis, opiates, benzodiazepines, barbiturates and ethanol, respectively and by GC/MS were; 16.15%, 10.25%, 8.97% and 8.46% for cannabis, benzodiazepines, barbiturates and opiates, respectively. Presence of these drugs has a serious effect on man health (mental and physical functioning), consequently his environment.

Keywords: Patients, Drugs, EMIT, GC/MS

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1. Introduction

Drug abuse is defined as the use of an illicit drug outside legitimate medical practice (Schnoll, 2000). Drug testing is performed on urine, since most drugs and their metabolites are excreted in urine in higher concentration than that in blood and because tests in urine are inexpensive and rapid. Urine toxicology analysis is a valuable, yet underutilized, tool to monitor patterns of medication use and use of illicit drugs to evaluate their effects on health outcomes (Hirabayashi *et al.,* 2004; McKay, 2005; Chen *et al*., 2006; Compton, 2007; McCabe *et al.,* 2008 and Mordal *et al.,* 2008).

Immunoassay techniques such as the enzyme multiplied immunoassay technique (EMIT) are used for drug screening techniques because they are rapid and require a small amount of samples.

Positive immunoassay results should be confirmed by a different method such as Gas Chromatography/ Mass Spectrometry (GC/MS) which is one of the most specific tools for drug testing with high sensitivity (El-Sohly, 2003). In addition to a greater specificity GC/MS enables also additional information about the quantity of substance involved (Eisen *et al.,* 2004; Kulig, 2005; McKay, 2005; Jaffee *et al*., 2007).

The purpose of the present study was to use laboratory based analyses of urine by two different methods to determine the prevalence and use pattern of some substances of abuse among a group of intoxicated patients presented to the toxicology unit in Mansoura Emergency Hospital.

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2. Materials and methods

2.1 Subjects

This study was conducted on 390 patients aged 15-50 years presented to Toxicology Unit in Mansoura Emergency Hospital with acute drug abuse overdose in the period between November 2009 and April 2014. The patients were from Dakahlia governorate and surrounding governorates. These patients were tested for the drugs.

2.2 Material

Immunoassay Kits:

Emit® d.a.u. ™ (drug of abuse in urine) Assays for qualitative analysis of opiates, benzodiazepines, barbiturates and cannabis in human urine.

Ethanol kit:

Emit® d.a.u. ™ ETS plus Ethanol Assay: for diagnostic use in the quantitative analysis of ethanol in human urine and serum. It should be used to detect ethanol exclusively and not other alcohols such as isopropanol or methanol.

2.3 Instruments

Syva Solaris system (Syva Co, USA*)* which is automated drug analyzer designed to work *Syva Emit* Kits. Using Emit® d.a.u. Assay.

GC-MS (Hewlett Packard, 6890 series): It separates the chemicals by retention time into constituent components. Mass spectrometry then identifies and counts the relevant components.

The conditions of GC–MS according to (Maurer and Weber, 1992):

-Column Hp-1 (ultra-1) Ion source temperature 200°C,

-Ionization voltage 70 eV, Initial oven temperature 70°C,

-Final oven temperature 250°C, Injection port temperature 250°C,

-Initial time 3.00 min, Final time 3.00 min, Equilibration time 0.50 min,

-Rate 8°C/min, Carrier gas Helium, Flow rate 13.5 ml/min.

2.4 Methods

In this study, data were collected as regards:

- Biosocial data: age, sex, social class, smoking habit and working status.

- Detection of drug abuse in urine samples by EMIT system.

A urine sample was taken from every patient immediately on admission and before initiation of treatment (forty ml urine was obtained from each patient). Preliminary drug screen test by EMIT system. Each urine sample was screened for cannabinoids, opiates, benzodiazepines, barbiturates and ethanol.

The cut off concentrations of drugs of abuse tested was: opiates (300 ng/ml), barbiturates (200 ng/ml), benzodiazepines (200 ng/ml) and cannabinoids (50 ng/ml) in case of EMIT and (15 ng/ml) in case of GC/MS as well as ethanol. Screening methods generally use higher detection cutoffs than do testing methods to reduce the incidence of false negative results (Jaffee *et al.*, 2007). Positive results obtained were confirmed using GC/MS analysis (Hewllet Packard, 6890 series).

2.5 Statistical analysis

Quantitative data were presented as mean ± standard deviation and qualitative data were presented as number and percentage.

3. Results

All samples were subjected to screening by EMIT and ethanol test and only positive samples were then confirmed by GC-MS.

Age and sex:

The age of patients ranged between 15–50 years with a mean age 25.72±7.05. The study showed that approximately half the patients were encountered in the age group 20<30 years (56.4%), followed by those aged 30<40 years (26.4%). Adolescents (15-20) years accounted for 10.77% of the patients. As regards sex, the present study revealed that males outnumbered females (92.8% and 7.2% respectively) with a sex ratio 12.9:1, Table (1).

Type of drug abuse overdose:

In the present study cannabis was the first abused drug (37.69%), opiates was the second drug abused by patients (27.18%)

followed by depressants (27.18%) whether of the benzodiazepine group (13.59%) or the barbiturate group (13.59%) and finally ethanol constituted (7.95%), Table (2). The study showed that female (n=28) were likely to abuse benzodiazepines (57.14%), the remaining abused;

cannabis (17.86 %), barbiturates (17.86%) andopiates (7.14%), Table (3).

The study revealed that the percentages of positive urine samples were; (27.18%, 14.87%, 11.54% 9.74% and 1.79), for cannabis, opiates, benzodiazepines, barbiturates and ethanol, respectively, Table (4). Positive results obtained by EMIT system were confirmed by GC/MS which revealed that the percentages of cannabis, benzodiazepines, barbiturates and opiates were; 16.15%, 10.25%, 8.97% and 8.46% respectively, Table (5).

Table 1. Patients (n=390) with drug abuse by Age and sex

Age group	Male		Female		Total	
	No	%	No	%	No	%
15-19	42	11.60	-	-	42	10.77
20-29	205	56.63	15	53.57	220	56.41
30-39	90	24.86	13	46.43	103	26.41
40-50	25	6.91	-	-	25	6.41
Total	**362**	**100.0**	**28**	**100.0**	**390**	**100.0**
Mean ± SD*	27.57±7.56		23.87±6.54		25.72±7.05	

4. Discussion

Most drugs of abuse are detectable by immunoassays. Once the urine sample has been identified as testing positive by a screening test, the specimen is retested with a more specific confirmatory test. Drug detection in urine depends to a great extent on the dose, duration of drug use and time sampling.

On the light of the results obtained through the study made on the patients, the mean patients' age was 25.72±7.05; Table (1). These findings support many reports which stated that substance abuse by young people had increased in the past decade. The rate of consumption is higher among 18-24 year old males. Also, the risk of illicit drug initiation increased steadily from ages 12-21 years (Nelson *et al*., 2001; Elekes and Kovacs, 2002; Flaker, 2002; Guo, 2002). This could be explained by the fact that this is the period of active life, work and responsibilities with more liability for facing problems, emotional difficulties, exposure to stress, and fear of failure. There is a false belief that drug use can help them to establish their individuality, independence, their ways of living, and to show their rejection of social standards (Macdonald, 1987; Farington, 1989; Swadi, 1999). Also, experimentation with new and different experiences is normal and necessary aspect of youth development. Experimentation may be followed by more frequent drug use that may progress to more serious abuse problems (Kaul and Coupey, 2002). Kapusta *et al.* (2007) stated that there is growing evidence that human adolescence is a period of increased biological vulnerability to the addictive effects of psychoactive substances. Chambers *et al*. (2003) suggested that a greater motivational drive in adolescence, together with an immature inhibitory control system, which is a part of the motivational neurocircuitry, could be responsible for impulsive actions and increased novelty-seeking behavior, including the experimental use of drugs.

Regarding gender, our study showed that men accounted for 92.8% of the studied group with 7.2% only for women (Men: women ratio is 12.9:1) as shown in table (1).Our findings confirm previous epidemiological data reported by Fergusson *et al.* (2008); Bloor (2006); El-Ghazali (2005); Abu El-Einen (2004); Emara (1998) who determined higher prevalence of substance abuse among men. Also, Rodham *et al.* (2005) found that males were more likely to report illicit drug use. In addition, Russel *et al.* (1994) found that the ratio of substance abuse in men to women was 3:1. In another study, 80% of substance abusers were men (Kringsholn *et al*., 1994). Moreover,

Table 2. Patients (n=390) with drug abuse by type of drug abuse and age

Type of drug Abuse	Age group								Total	
	15-19		20-29		30-39		40-50			
	No	%	No	%	No	%	No	%	No	%
Cannabis	15	36	84	38.2	34	33	14	56.7	147	37.69
Opiates	11	24.9	65	29.6	25	23.7	5	21.3	106	27.18
Benzodiazepines	9	21.3	18	8.2	23	22.1	3	10	53	13.59
Barbiturates	5	12.9	36	16.5	12	11.6	-	-	53	13.59
Ethanol	2	4.9	17	7.5	9	9.6	3	12	31	7.95
Total	**42**	**100**	**220**	**100**	**103**	**100**	**25**	**100**	**390**	**100**

friendly relations, criminal and aggressive behavior associated with substance abuse play an important role making it easier for men to be involved in drug abuse (Emara, 1998). Brady and Randall (1999) attributed the predominance of drug abuse among men due to the fact that substance abuse is more stigmatized in women who also experience more social disapproval of drug use.

Table 3. Patients (n=390) with drug abuse by type of drug abuse and sex

Type of drug abuse	Males		Females		Total	
	No	%	No	%	No	%
Cannabis	142	39.23	5	17.86	147	37.69
Opiates	104	28.73	2	7.14	106	27.18
Benzodiazepines	37	10.22	16	57.14	53	13.59
Barbiturates	48	13.26	5	17.86	53	13.59
Ethanol	31	8.56	-	-	31	7.95
Total	**362**	**100**	**28**	**100**	**390**	**100**

Table 4. Percentages of positive urine samples of abuse drugs (n=390) by EMIT system

Type of drug abuse	Cut off ng/ml	No of urine samples	EMIT system	
			Positive	
			No	%
Cannabis	50	147	106	27.18
Opiates	300	106	58	14.87
Benzodiazepines	200	53	45	11.54
Barbiturates	200	53	38	9.74
Ethanol	-	31	7	1.79
Total		**390**	**254**	**65.12**

Table 5. Confirmatory tests by GC/MS for EMIT positive drugs (n=254)

Type of drug abuse	Total No of urine samples	positive urine samples By EMIT	GC/MS	
			Positive	
			No	%
Cannabis	147	106	63	16.15
Opiates	106	58	33	8.46
Benzodiazepines	53	45	40	10.25
Barbiturates	53	38	35	8.97
Ethanol	31	7	-	-
Total	**390**	**254**	**171**	**43.83**

The present work showed that the percentages of positive urine samples using EMIT were (27.18%, 14.87%, 11.54%, 9.74% & 1.79%) for cannabinoids, opiates, benzodiazepines, barbiturates and ethanol, respectively, Table (4). However, immunoassay techniques lack specificity, and are subject to false-positive and false-negative test results. Therefore, all specimens identified as positive on screening test should undergo confirmatory analysis. Gas chromatography/mass spectrometry (GCMS) is generally accepted by the scientific community for the confirmed identification of drugs of abuse (Katz & Fanciullo, 2002). Hence, our positive results obtained by EMIT were confirmed by GC/MS which revealed that the prevalence rates were as follows: cannabinoids (16.15%), benzodiazepines (10.25%), opiates (8.46%) and barbiturates (8.97%), Table (5).

Cannabis is thought to be passed by religion because religious prohibition of alcohol did not completely prevent the use of other psychoactive substances (Soueif, 1994; Ewida *et al.,* 1996). Similarly, In addition, 67% of young men aged 18-30 years use marijuana on a regular basis in emergency department injured patients (Rich and Grey, 2005).

Our study showed that benzodiazepines and opiates were also common drugs of abuse. Several studies have reported recent increases in the number of prescriptions for opioid medications in the general population (Joranson *et al.*, 2000; Zacny *et al.*, 2003) and these increases appear to parallel the increases in illicit use among adolescents (Johnston *et al.,* 2003a,b). So, epidemiological findings demonstrate that abuse of these drugs especially benzodiazepines is on the rise and cause for concern (Licata and Rowlett, 2008). In negative samples, detection of lower concentrations leads to problem in the toxicological interpretation of the result, because passive smoking must be considered. It must be remembered that negative results of other drugs obtained by GC/MS doesn't mean that those drugs weren't ingested, only they weren't detected due to their concentrations were below the sensitivity range of the assay used or the sampling time wasn't optimal. Thus GC/ MS analysis help to solve the false positive results obtained by EMIT. False-negative opiate test results do occur and can be challenging to interpret. Studies suggest that between11% and 21% of samples test negative on confirmatory GC/MS analysis (Fishbain *et al.,* 1999; Katz *et al.,* 2003). Certain opiates metabolize to other opiates, so both or only the metabolite—may appear in the urine sample (Katz & Fanciullo, 2002).

Although the presence of an illicit drug in the urine shows that the patient has used this drug in the recent past, it should not be concluded that a substance use disorder

(abuse or addiction) is present (Walker & Hohmann, 2005). Diagnosis of addiction should never be based on the results of urine toxicology alone and should be considered within the context of aberrant medication use, drug-seeking behaviors, and unimproved or declining function (Compton & Athanasos, 2003).

5. Conclusion

The data of the present work revealed that some drugs of abuse are existing in our life. Presence of these drugs has a serious effect on man health (mental and physical functioning), consequently his environment.

6. Recommendations

The following recommendations are suggests:

- Continuous health education and prevention programs concerning health hazards of drug abuse and the importance of seeking early treatment.
- Development of school and university programs designed to assist in developing problem solving and coping with stresses, conflicts and difficulties, instead of escaping to drugs abuse.
- A screening immunoassay technique should be done on urine samples periodically and better to be confirmed using gas chromatography/ mass spectrometry as the later is more specific for drug testing with high sensitivity.

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