Common Drugs Used by Saudi Addicts Detected by Drug Screening

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ABSTRACT

A total of 20 patients, ranging in age from 19 to 45 years, with a strong history and drug screening evidence of drug addiction were separated out of 200 cases attended at the Emergency Unit of Riyadh Medical Complex as drug overdose patients. Drugs identified as substances of addiction were Psycho-stimulants (45%), Narcotic Analgesic (25%), Inebriants (20%), and Miscellaneous (10%). The study also showed that all the cases were Saudi males, 75% were single, 50% were of average income group and 10% were wealthy. Social problems, lack of parental supervision, psychosis, loss of occupation, and uncontrolled freedom were thought to be the major causes of drug addiction. The final medical outcome of all the cases was satisfactory and this was due in large part to the early detection of the drugs, prompt management and to the state of good health services in the Kingdom of Saudi Arabia in general.

(Key Words: drug screening, addiction, overdose, inebriants, narcotic analgesics,

psycho-stimulants, emergency medicine)

INTRODUCTION

The American Psychiatric Association & the World Health Organization have offered standard definitions of addiction. The major criteria for addiction can be determined by gradual increases in necessary doses, unsuccessful attempts to quit, excessive time spent in actively seeking drugs, feeling intoxicated, marked tolerance, and specific signs and symptoms after drug withdrawal.

Each addicting drug has its own profile regarding the level of craving it can cause; the severity of withdrawal symptoms; and the intensity of high it brings. Heroin has a painful and powerful withdrawal associated with its use, as does alcohol. But cocaine has little or no withdrawal effects. On the other hand, cocaine is more habit-forming in some respects; it is more reinforcing. In the scientific terminology, this means that animals and humans will seek to use it frequently in short periods of time, even over food and water. On the scale of how difficult the drugs are to quit as well, nicotine is considered by most experts as the most difficult one to quit. In the Kingdom of Saudi Arabia, there are strict religious and governmental restrictions about the prescription and selling of addiction forming drugs. In spite of that, drug addiction is not infrequent here. The authors therefore designed a study to detect drugs of addiction in patients attended with a suspected drug poisoning.

MATERIALS AND METHODS

A total of 200 cases of suspected drug overdose, brought to the Emergency Department of Riyadh Medical Complex were involved in this study. Ten percent of the cases (n=20) were identified as drug addicts. All cases of addiction examined in this study were Saudi males with ages ranging from 19 to 45 years. Samples of blood, urine and gastric wash were collected for drug screening and processed in the Toxicology Laboratory. The samples were analyzed qualitatively to identify the drugs and quantitatively to measure the level of these identified drugs. The detected drugs were classified into distinct classifications, while the cases were studied and classified according to the pattern of exposure, marital and economic status, etc. The addictive patients were separated and followed in the wards until discharge and the details were recorded in a predetermined format.

1. The qualitative method:

The method used for qualitative detection of drugs was based on thin layer chromatography technique. In this technique compounds are separated from one another due to their relative affinities for a polar solid stationary phase (hydrated silicate) and mobile non-polar liquid phase (ethyl acetate and dichloromethane). Depending on their affinities, different compounds adsorb to the hydrated silicate at different positions as the non-polar solvent migrates up the stationary hydrated silicate. The ratio of the distance traversed by the solvent is a constant (Rf) for the compound and it can be used for its identification in a mixture. Thin layer chromatography method has now been packaged in the form of Toxi-Lab Kits (Irvin, CA, U.S.A), in which the user is supplied with discrete strips of silicate, extraction solvents, and color-developing solutions. The method was available, convenient and fairly reliable hence used in our study.

Toxi-Lab Procedure:

This chromatographic procedure has been applied mainly to the qualitative detection of drugs of abuse and toxins (Richard Ravel, 1995). The samples used are urine, gastric wash, blood, and/or suspected material used by the patient (i.e., pills, powder, etc.). The sample of choice is urine, because large quantities of this body fluid can be obtained; furthermore most drugs and drug metabolites are present in relatively high concentrations in urine. The available specimen is subjected to extraction procedures. In these procedures acidic drugs are separated from basic and neutral ones. In aqueous solution, the basic drugs are charged because of the equilibrium as shown below:

$$R\text{-}NH2 + H^{+} <=> R\text{-}NH3$$

$$R\text{-}NH3 + OH^{-} <=> R\text{-}NH2 + H2O$$

The ammonium ion is soluble in polar solvents (water), but not in non-polar organic solvents. The amine free base (R-NH2) is soluble in non-polar solvents. Almost all drugs of abuse are basic drugs, all of which are amine derivatives. The important so-called acid drugs almost exclusively comprise the barbiturate family.

Extraction procedures to isolate the basic drugs are aimed at treatment of specimen with base so that significant amount of basic drugs will be uncharged as the amine free base. This form can be extracted into a non-polar organic phase and then applied to the silicate plate.

The reverse process is carried out for acidic drugs, that is, these are treated with acid and extracted in non-polar solvents. A small paper disk is added to the organic extraction mixture, and the solvent is then evaporated on a hot plate so that the drug is adsorbed onto the paper disk. The disk is applied to the end of silicate Toxigram, which already has known control-discs and then placed in the migrating non-polar solvent.

A separate plate is used for each type of extraction (Toxigram A is used for basic drugs and Toxigram B for acidic drugs). Each extraction has its own developing solution as shown below. For fixation, plate A is placed in a jar which contains a formaline vapor, while plate B is dipped in a s-diphenylcarbazone solution and is left to air dry. Plate A is left in the formaline vapor for 5 to 30 minutes, then removed and kept in a hot plate to evaporate the formaline vapor.

Identification of specific drugs is achieved by various color reactions for each compound. Toxi-Lab has the added feature of subjecting the separated compound to a series of color reactions that further assist in identification of drugs. Plate A is carefully dipped successively in three different solvents (concentrated sulfuric acid, distilled water, and Dragendroff reagent), which results in characteristic color patterns for each commonly screened drug. The plate is also subjected to ultraviolet light, which excites fluorescence in selected compounds (this is done before dipping the plate in Dragendroff reagent).

Similar procedures are used for acidic drugs extracted in B plates, but the plate B is dipped successively in two different solvents (silver nitrite solution and mercuric sulfate solution) and ultraviolet light. Each drug can be identified by the ratio of the distance traversed by the solvent front, which is a constant for the compound known as (Rf), but also by its color and characteristic color change in different reagents. These patterns are reinforced by fluorescence characteristics.

For example: Heroin has a characteristic Rf of 0.14 and it shows a characteristic dark red color in the first solvent that disappears in the second solvent (water). It is also non-fluorescent. If one or more of these characteristics differ from this pattern, strong doubt about the identification of the spot as heroin would exist. If all criteria are met, the sensitivity and specificity of the method are increased.

Solutions Used and Their Preparations

Stock Developing Solution for TOXI-LAB A:

87 ml ethyl acetate

3ml methanol

1.5ml de-ionized water

Developing Solution for TOXI-LAB A:

3ml stock developing solution A

20-30 μl ammonium hydroxide (per plate)

Note: This quantity is for one plate and as the number of plates increase, the quantity is multiplied. A maximum of three plates can be processed at a time.

Stock Developing Solution for TOXI-LAB B:

60 ml dichloromethane

40 ml ethyl acetate

Developing Solution for TOXI-LAB B:

3 ml stock developing solution B

150 μ l ammonium hydroxide (per plate)

Note: This quantity is for one plate and as the number of plates increase, the quantity is multiplied. A maximum of three plates can be processed at a time.

TOXI-DIP Solution for the Plate A:

TOXI-DIP A-1: 15ml of 37% formaldehyde

TOXI-DIP A-2: Concentrated sulfuric acid

TOXI-DIP H_2O: Distilled water

TOXI-DIP A-3:The vial A-3 (Dragendroff 5 reagent) then 10 ml of glacial acetic acid complete with Distilled Water and mix (Total volume 250 ml).

TOXI-DIP Solutions for the Plate B:

TOXI-DIP B-1: The vial B-I (s-diphenylcarbazone solution) complete with Dichloromethane and mix (Total volume 250 ml).

TOXI-DIP B-2: The vial B2 (Silver nitrite solution) complete with Distilled Water and mix (Total volume 250 ml).

TOXI-DIP B-3: The vial B-3 (Mercuric sulfate solution) complete with distilled water, add l0ml of concentrated sulfuric acid and mix (Total volume 250 ml).

2. The quantitative method:

The method used for quantitative detection of drugs was TDX/FLX Automated Machine. The system uses Fluorescence Polarization Immunoassay (FPIA) technology as described below.

In the system, the tungsten halogen lamp emits light of different wavelengths or colors with random spatial orientation. In front of the light source, there is an interference filter that allows only blue light (481-489nm) to pass through. The light is then passed through a crystal polarizer to produce plane-polarized light, which excites the tracer or fluorophore and raises it to an excited state. By emitting green light (525-550nm), the fluorophore returns to steady state. When the fluorophore is bound to a large antibody it doesn't rotate freely and the emitted green light will be in the same plane as the blue excitation light and polarization is retained. Conversely, when the fluorophore rotates freely the emitted green light will be in different plane than the blue excitation light and polarization will be lost.

By measuring the proportion of polarized light in the total light output from the label the amount of bound label in the presence of free label can be calculated. Abbott Company supplies the user with reagents, controls and calibration kits as well as glass tubes, sample cups centrifuge tubes and dilutents.

TDX/FLX Automated Machine Procedure:

In this method about 60 uL of serum or urine is measured and placed in sample cup and the same amount of three controls (Low, Medium, and High) are placed in the next in a serial order on the carousal. The appropriate Reagent Pack is taken and kept on the assigned platform in the system and the carousal is kept as well, then RUN button is pressed and the precise result will be given in a printout within few minutes. Control values should fall within two SD of the prescribed value, to accept the result. The System should be calibrated for a new lot of Reagent/Control.

RESULTS

The cases of addiction were divided according to detected drugs into four drug groups: Group 1, Inebriants; Group 2, Psycho-stimulants; Group 3, Narcotic Analgesics; and Group 4, Miscellaneous compounds.

Group 1: Alcohol was the only inebriant identified in this study, and its poisoning was detected in 4 cases; all of them were Saudi males between 25-41 years. One case did not require therapy, one received Emergency-Care, and two cases were admitted in the wards. The economic status of these patients was as follows: one case was poor, two were average, and one case was of rich status. Two cases were single, and two were married (Table 1).

Group2: In this group amphetamine overdose was detected in all cases (n=9). All of the patients were Saudi males between 19-37 years of age. Three cases did not need therapy; two received Emergency Care, and the remaining four cases were admitted in the ward. The economic status of the cases was distributed as follows: four poor cases, four average, and one rich. One of the cases was single, while the remaining eight were married (Table 1).

Group3: Morphine overdose was detected in the five cases of this group. All of the patients were Saudi males with age ranged from 25-35 years. One case did not need therapy, four received Emergency Care and none was admitted. Three cases were of average economic status, and two cases were poor; four were single, and one was of a divorced male (Table 1).

Group 4: Only two cases were classified in this group. Both of the patients were Saudi males. The intake of two drugs (amphetamine + morphine) was confirmed in these cases. They were patients were 37 and 45 years old and they both received Emergency Care. The economic status of one case was average, and one was poor. One case was single and one was married (Table 1).

Table 1: Distribution of addiction cases according to the drug groups detected by Drug screening.

Drug Group	Number of cases						Marital Status			Management			Economic Status		
	#	Age	M	F	S	NS	Married	Single	Divorced	NT	EC	AD	P	A	R
Inebriants	4	25-41	4	0	4	0	2	2	0	1	1	2	1	2	1
Psycho-stimulants	9	19-37	9	0	9	0	1	8	0	3	2	4	4	4	1
Narcotic Analgesics	5	25-35	5	0	5	0	0	4	1	1	4	0	2	3	0
Misc.	2	37-45	2	0	2	0	1	1	0	0	2	0	1	1	0

M: Male, F: Female, S: Saudi, NS: Non-Saudi, NT: No Therapy, EC: Emergency Care, AD: Admission,

P: Poor (Monthly income<300SR), A: Average (income 3000-6000 SR), R: Rich (income>600SR)

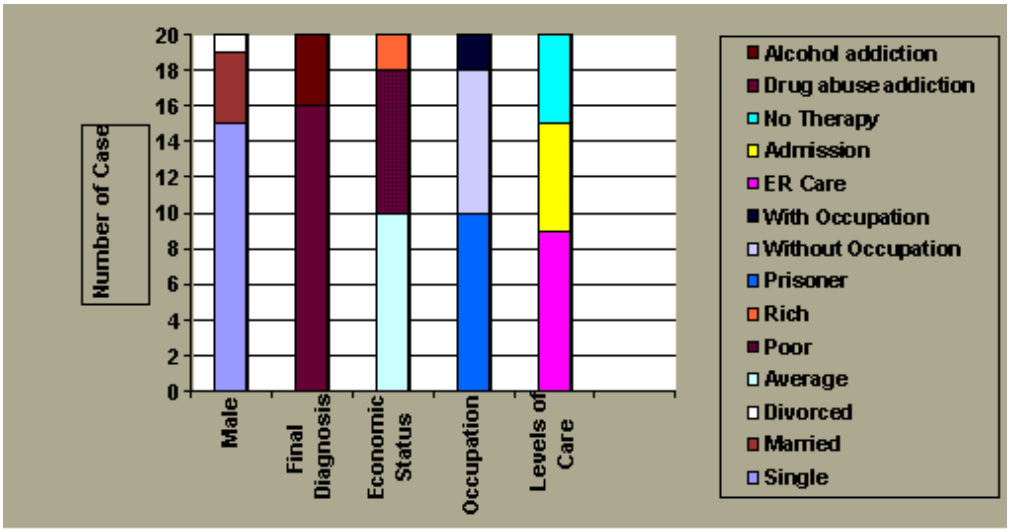
DISCUSSION

The study did not report any addiction in either females or non-Saudis. Addiction was identified in 20 Saudi cases, which accounted for 10% of the suspected drug overdose cases (n=200). This percentage was relatively high when compared with the data from the American Association of Poison Control Center (AAPCC) 1990, in which intentional poisonings accounted for 9.7% of all cases. Intentional poisoning includes both suicide attempts and drug abuse. If we know that suicidal poisoning in our previous studies accounted for 40% while addiction accounted for 10% we can conclude that intentional poisoning ratio in our study (40%+10%) is more than five times the ratio given by American Association of Poison Control Center 1990.

The addiction recorded was either by drug of abuse (80%) or alcohol addiction (20%). Addiction was found among poor, average, and rich class. Rich people can buy freedom and

influence to enjoy prohibited substances, while in average and poor class to escape from reality of day-to-day life and domestic or economic problems (Figure 1).

Figure 1: Distribution of Cases of Drug Addiction.



Further follow up of the cases showed that 50% of the cases were prisoners who were brought to the hospital by the police. Seven of the prisoners were without occupation; two were businessmen with alcohol addiction, and the remaining patient was a student (Figure 1). Most of the addict cases (75%) were single, 20% were married, and the remaining (5%) were divorced. Again it was concluded that marital status has a role since addiction risk is greater in single than in married individuals (Figure 1).

The drugs detected in drug screening were presented in Table 1. The major category represented in this study was Psycho-stimulants (45%), and the minimum one was those compounds represented in the Miscellaneous group (10%). Because in some amphetamine preparations, acetaminophen is one of the components, the presence of analgesics' in drug screening was reasonably justified. It was noted that two cases of amphetamine addiction were smokers. The presence of anti-psychotic, antidepressant, and anti-epileptic drugs in combination with morphine indicated that some drug addicts were suffering from psychosis, depression, and epilepsy respectively. The final emergency medicine outcome of all addiction cases was satisfactory.

CONCLUSIONS

The addiction identified in this study accounted for 10% of the exposures and this percentage was relatively high when compared with the data from the AAPCC. The addiction recorded was either by drug of abuse (80%) or alcohol addiction (20%). Addiction was three times more in singles than in married cases.

The drugs detected in addiction were classified into four main groups, the major group was the Psycho-stimulant group (45%), and the minimum one was the Miscellaneous group

(10%). The final outcome of all addiction cases was satisfactory. It was concluded that social problem, lack of parental supervision, psychosis, loss of occupation, and uncontrolled freedom were found to be the contributing factors.

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