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Incidence of Substance Abuse Among Cab-drivers Involved in Non Fatal Accidents

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ABSTRACT

Road Traffic Injuries (RTIs) represent a major global health problem. Substance abuse is a major contributing factor for such injuries. The current study aimed to investigate the problem of substance misuse among cab-drivers involved in non-fatal accidents. This cross-sectional study carried out at Al-Azhar University Hospitals (Cairo, Al-Hussein and Bab El-Sharia Hospitals), during the period from August 2012 to August 2014. All cab-drivers who were admitted to the emergency department with non-fatal motor car trauma were asked to participate. We identified 80 eligible drivers, 20 of them refused to participate. Thus, the final included cases were 60 drivers. Positive cases were 32 with an incidence rate of 53.3%. All were males. Socio-demographic factors were documented and urine samples were drawn to screen for abused substances (e.g., opiate, methamphetamine, tetrahydrocannabinol, barbiturates, benzodiazepines and tramadol). The most common abused substance was cannabis (THC) (90.6%), then tramadol in 59.4%, barbiturates in 34.4%, opiates in 28.1%, benzodiazepines in 25% and finally methamphetamine in 21.9%. In addition, 90.6% abused two or more substances concomitantly and 9.4% had a single substance. This study highlighted the magnitude of substance abuse in cab-driver. The most common abused drug was cannabis and the least was methamphetamine. The majority of cases (90.6%) abused more than one substance.

Key words: Drug abuse, cab-drivers, non fatal accidents

INTRODUCTION

Road Traffic Injuries (RTIs) represent a major global health problem which has been neglected for a long time. World Health Organization reported that, approximately 1.3 million people die each year on the world's roads and between 20-50 million people sustaining non fatal injuries (WHO., 2009). Indeed, drivers who drive under the influence of drugs represent major threat to themselves and others on the road (Beirness and Beasley, 2010). To address the significance of this problem, Mathers *et al*. (2004) reported that, road traffic injuries are highly comparable to the number of deaths resulting from communicable diseases.

The significance of this health problem is most distressing in low and middle-income countries, as high as 90% of the world's road traffic related fatalities occurred in these countries. In Egypt, a road traffic fatality rate is 42 deaths per 100,000 inhabitants. It is one of the highest rates in the Eastern Mediterranean Region. The RTIs are also responsible for 1.8% of all deaths and 2.4% of all disability-adjusted life years lost in Egypt (WHO., 2009).

There are several reasons may be responsible for driving under influence of drugs. First, increased use of recreational drugs among driving people (Calafat *et al*., 2009). Second, it may occur

in drivers for long distances (National Highway Traffic Safety Administration, 2007). It has been shown that the risk of death following traffic accidents increases when it is secondary to substance misuse (Lillsunde *et al*., 2012).

There are many abused drugs that affect driving tasks, even if ingested in small dosages and the risk of accidents increase even if there is no sign of impairment in driver's abilities (Lillsunde *et al*., 2012).

One of favorable features of motor car accidents is its nature as a preventable problem. In order to design effective preventive strategies, it is so pivotal to have an epidemiological data about the problem (National Highway Traffic Safety Administration, 2007).

The epidemiological pattern of substance abuse varies from one location to another and from one category of drivers to another, knowledge of local patterns of drugged driving is of utmost importance to improve road safety. Screening tests for most commonly abused substances in suspected cases are designed according to epidemiological data for each location. However, epidemiological data about substance abuse in developing countries are limited due to abscess of an effective, comprehensive, national screening programs and the absence of studies about the problem itself (Calafat *et al*., 2009). In Europe and North America, different populations (general mass, professional drivers, drivers involved in crashes) are being enrolled to the epidemiological studies on drugged driving (Impinen *et al*., 2009; McCree *et al*., 2010; Walsh *et al*., 2004).

One of the populations that are being studied in epidemiological studies is cab drivers who sustained non fatal injury in motor car accidents. However, there is very limited data (if any) on those drivers in Egypt. Thus, the present study was designed to address this problem.

The current study is aimed to investigate the problem of substance abuse among cab-drivers involved in non fatal car accidents in Cairo, Egypt.

MATERIALS AND METHODS

This cross-sectional study was carried out at Al-Azhar University Hospitals in Cairo (Al-Hussein and Bab El-Sharia Hospitals) during the period from August 2012 up to August 2014. An ethics committee of the Forensic Medicine and Clinical Toxicology Department approved the study protocol. All participants were informed about the study aim and research design were explained. Then, an informed consent was obtained from those who agree to participate. Reassurance of confidentially was confirmed. All data were documented by a code, rather than patients name. All cab-drivers who were admitted to the emergency department with non fatal motor car trauma were asked to participate. We could identify 80 eligible drivers, 20 of them refused to participate. Thus, the final included subjects were 60 drivers. Positive cases were 32 with a prevalence rate of 53.3%. All were males. It must be stressed that, cab-drivers represent a small category of all drivers in Cairo, they were targeted in this study as there were no data about substance abuse among this category of drivers.

After stabilization of the patient condition, demographic characteristics were asked by researcher. These data included age, residence, education level, marital status, previous problems with the legal system and special habits (such as smoking). A positive medical history of common chronic diseases such as chronic chest diseases, cardiac diseases, neurologic diseases, diabetes and hypertension were documented. History of conditions affecting driving skills (stroke, Epilepsy and metabolic coma) was excluded.

The number of working hours was reviewed and then a sample of 30-50 mL urine, centrifuged and screened for abused drugs; opiate, methamphetamine, cannabis (tetrahydrocannabinol), barbiturates, benzodiazepines and tramadol. All specimens were analyzed by immunoassay EIA kits (Neogen's Kits) specific for each drug group and the analysis was done according to the manufacturer instructions. Kits used were barbiturate group (RTU), 96 well kit-130619; benzodiazepine group (Oxazepam/Clonazepam) (RTU), 96 well kit-130119; THC (RTU), 96 well kit-131019; opiate group (RTU), 96 well kit-130419; tramadol (RTU), 96 well kit-131819; amphetamine, 96 well kit-105219-1.

Assay principle: Neogen's direct competitive ELISAs operate on the basis of competition between the horseradish peroxidase (HRP) enzyme conjugate and the analyte in the sample for a limited number of specific binding sites on the precoated microplate.

Assay procedure: Samples, standards or calibrators are first added to the precoated antibody microplate. Next, the enzyme conjugate is added and the mixture is incubated at room temperature. During incubation, competition for binding sites on the microplate is taking place. The plate is then washed removing all unbound material. The bound enzyme conjugate is detected by the addition of a TMB based substrate.

Test results obtained by measuring and comparing the absorbance reading of the wells of the samples against the standards with a microplate reader at 650 or 450 nm if acid stop is used. The extent of color development is inversely proportional to the amount of analyte in the sample or standard. For example, the absence of the analyte in the sample will result in a dark blue color, whereas the presence of the analyte will result in a light blue color or no color as the concentration of the analyte increases. If acid stop is used to halt the assay then the dark blue color will change to a dark yellow color and the light blue color to no color will change to light yellow to no color. Results were assigned as positive or negative. Positive cases were confirmed by Gas chromatography-mass spectrometry (GC-MS).

Reagents and standards: All reagents were analytical or HPLC grade. The drug standards (THC, methamphetamine, opiates, tramadol, barbiturates and benzodiazepine) were provided by Shanghai Public Security Bureau, China. These standards were spiked into urine at concentration of 0.1-40 ng μL^{-1} to test the sensitivity of the method. Potassium hydroxide, glacial acetic acid, ammonium acetate, n-hexan, ethyl acetate and methanol HPLC grade (Sigma); ammonium hydroxide, methanol, Campbell Science Corp (Rockton, IL), BSTFA-Bis (trimethylsilyl) trifluoroacetamide with 1% TMCS, Pierce (Rockford, IL) and Toxi-Tubes A and B, Agilent technologies (Crawford scientific Co.). Toxi-tubs are one step process for extracting a broad range of drugs from biological or non-biological specimens. Toxi-tube A (Pre-measured solution of buffering salts (pH 9) and organic solvents) was used with organic bases and neutral drugs. Toxi-tube B (Pre-measured solution of buffering salts (pH 4.5) and organic solvents) was used with acidic and neutral drugs.

Extraction (By Liquid/liquid extraction (LLE))

Cannabis (THC): For a 5 mL urine 300 μL of 10 M potassium hydroxide solution and internal standard (for GCMS deuterium labeled 11norΔ9TH carboxylic acid) were added. The samples were hydrolyzed at 60°C for 15 min in water bath. After cooling, 200 μL glacial acetic acid and 2 mL

50 M ammonium acetate solution added (pH is adjusted to 6.0-7.0). Then the samples were extracted with10 mL n-hexan, mixed by vortex for 3 min, centrifuged for 10 min at 2400 rpm. The upper clear layer was transferred into the corresponding labeled tubes. The extraction was dried in the sample concentrator at 45°C under Nitrogen gas. The 50 μL of ethyl acetate water free and 50 L of BSTAFA were added, mixed will and put in the oven at 70°C for 20 min. The preparation transferred into the glass insert and injected onto the GC-MS (Moffat *et al*., 2004).

Methamphetamine, opiate, tramadol, barbiturate and benzodiazepine: Toxi-tubes A and B were used for extraction.

Procedures: Urine 3-5 mL and internal standard were added to toxi-tubes, genital shaking to mix the sample with the tube content (solvents and salts), centrifuged for 3 min at 3500 rpm. The upper clear layers transferred, evaporated at 45°C under Nitrogen gas to dryness, reconstituted in 100 μL methanol and injected onto the GC-MS.

Gas chromatograph: PerkinElmer® Clarus® 680 GC Injector; capillary injector split mode, 250°C split ratio: 50:1. injection port liner: Siltek™ with wool (Cat. No. N6502010).

GC column: Elite-5 (5% Phenyl/95% Methyl Silicone)-2 m×200 mm×0.33 μm (Cat. No. N9316110). Helium carrier-2 mL min^{-1}.

GC oven: Start temperature 100°C hold for 0.5 min, then 40°C min to 300°C equal to 10 min.

Mass spectrometer: Perkin Elmer Clarus SQ 8 GC/MS 255 L sec^{-1} turbomolecular pump, EI mode, scan range: 35-500 da, 0.25 sec per cycle.

Procedure: The specific GC oven program for the analysis of opiates start temperature 100°C hold for 0.5 min, then 20°C min^{-1} to 310°C hold 4 min. For cannabis; the oven was maintained at 11°C for 3 min, then at 210°C for 2 min and at 300°C for 5 min. For other drugs; start temperature 100°C hold for 0.5 min, then 40°C min to 300°C equal to10 min.

Quantitative analysis: For quantitative analysis of THC and abused drugs, the detector was operated under SIM mode (mass and fragments) according to Department of Health and Human Services (2010).

Anyone positive for one or more tested drugs was considered positive, those who are negative for all tested substances were assigned as negative.

RESULTS

Socio-demographic data for positive cab-drivers are presented in Table 1. Results revealed that, all participants were men and most were married (56.3%) had poor education (28.1% were illiterate; 28.1% read and write and 8.1% had middle education) living in urban areas (59.4%). Almost 37.5% of them had previous legal problems; 12.5% were non-smokers, 18.8% had light smoking and the majority of them (68.8%) were heavy smokers. The number of cigarettes per day ranged from 2-36 cigarettes per day with a mean of 17.07±10.75, chronic chest disease was reported in 56.6%, diabetes mellitus in 7 cases (21.9%) and hypertension in 46.9% and finally, working hours ranged from 10-12 h with a mean of 11.43±0.91 h.

Table 1: Socio-demographic data of positive cab-drivers for drug abuse

Age (years)	Statistics
Marital status	42.03±12.47; 24-62
Single	8 (25%)
Married	18 (56.3%)
Divorced	3 (9.4%)
Widow	3 (9.4%)
Education level	
Illiterate	9 (28.1%)
Read and write	9 (28.1%)
Middle	9 (28.1%)
Higher	5 (15.6%)
Residence	
Urban	19 (59.4%)
Rural	13 (40.6%)
Previous law problems	
Yes	12 (37.5%)
No	20 (62.5%)
Smoking	
None	4 (12.5%)
Mild	6 (18.8%)
Heavy	22 (68.8%)
Cigarettes/day	17.07±10.75; 2.0- 36
Chronic chest disease	21 (56.6%)
Diabetes mellitus	7 (21.9%)
Hypertension	15 (46.9%)
Working hours/day	11.43±0.91; 10-12

Table 2: Drug test results among cab-drivers

	Statistics	
Parameters	Negative	Positive (%)
Opiate	23 (71.9%)	9 (28.1)
Methamphetamine	25 (78.1%)	7 (21.9)
Cannabis (THC)	3 (9.4%)	29 (90.6)
Barbiturate	21 (65.6%)	11 (34.4)
Benzodiazepines	24 (75.0%)	8 (25.0)
Tramadol	13 (40.6%)	19 (59.4)
Exposure	Single	3 (9.4)
Pattern	Multiple	29 (90.6)

The results of the drug testing revealed that, the most common abused substance was cannabis (THC) (90.6%), then tramadol in 59.4%, barbiturates in 34.4%, opiates in 28.1% (codeine; 4 cases, oxycodone; 3 cases, morphine; one case, fentanyl; one case); benzodiazepines in 25% and finally methamphetamine in 21.9%. In addition, 90.6% abused two or more substances concomitantly and 9.4% had single substance (Table 2).

DISCUSSION

Results of the present study revealed that, 53.3% of cab-drivers involved in non fatal motor car accidents were illicit substance abusers. The results of the drug testing revealed that, the most common abused substance was cannabis (THC) (90.6%), then tramadol in 59.4%, barbiturates in 34.4%, opiates in 28.1%, benzodiazepines in 25.0% and finally methamphetamine in 21.9%. In addition, 90.6% abused two or more substances concomitantly and 9.4% had single substance. These results are comparable to those reported by Assari *et al*. (2014) who reported that, 60% of Iranian drivers who are involved in fatal car accidents use drugs. However, they found opioids to be the most common abused substance followed by cannabis. The higher rate of cannabis abuse among those drivers can be attributed to the wide availability of Hashish in Egypt. In addition, it is easily obtained when compared to another drugs.

The high rate of abused substances in studied cab-drivers can be associated with sociocultural factors such as low education or stress of long duration on duty. In addition, the high rate of drug use among cab-drivers incorporated in non fatal crashes can be explained by the known association between driving under the influence of drugs and the incidence and severity of car accidents (Mason and McBay, 1984).

The mechanisms by which drugs increase the incidence and severity of motor car accidents include the following: impairing mental functions, reducing attention, reducing concentration on driving tasks, impairing coordination, increasing reaction time and altering distance and speed adjustment. Cannabis for example lead to misinterpretation of time, place and space. Other effects include poor vision and muscle weakness (Ogden and Moskowitz, 2004).

Unfortunately, it did not find any data describing the epidemiology of drug abuse in non fatal crashes by cab-drivers in Egypt. However, data are available concerning drug abuse in general in all motor car accidents. For example, cannabis (46.7%) was the most commonly found drug in injured drivers involved in motor vehicle collisions in Australia. The second most prevalent substance was benzodiazepines (15.6%), followed by opiates (11%), amphetamines (4.1%) methadone (3%) and cocaine (1.4%) (Ch'ng *et al*., 2007).

On the other hand, a low rate of drug abuse was reported in Hong Kong (Wong *et al*., 2010). In addition, marijuana and alcohol are the most prevalent abused substances in many industrial countries, found among impaired drivers who are involved in fatal or non fatal motor car accidents. Other illegal drugs had lower prevalence. These include cocaine, opiates and amphetamines (Soderstrom *et al*., 2001).

It had been reported that, the prevalence of important psychoactive substances such as amphetamines, cocaine and marijuana vary from country to the other and from continent to other. The study by Mongkolsirichaikul *et al*. (1988) in Thailand reported that, amphetamine is the most common abused substance 82.5%. The same authors reported that, the excessive work hours (around 20-22 h) and possible addiction may be the reasons for these high levels.

In addition, Girotto *et al*. (2014) reported that, the intake of psychoactive substances by truck drivers is a relatively frequent occurrence, although the prevalence varies according to the place and methodology employed. Furthermore, intake is positively correlated with poor driving conditions as driving hours.

According to results of the present study, it is advocated to routinely screen for illicit drugs in those applying for a driving license and to be frequently checked on a regular basis. This is an important policy as high rates of driving under illicit drugs was reported in such countries had no drug screening policy (Ch'ng *et al*., 2007). Such policies can decrease the burden attributed to drug use by motor vehicle drivers (Goulle *et al*., 2008). Each country should build his it's menu of screening tests.

One limiting step of the present study is the small sample size and inclusion of specific category of drivers (not all drivers incorporated in non fatal motor car accidents). Despite that, this study highlighted the magnitude of substance abuse in cab-driver. It is the first step forward.

Thus, it is recommended to establish national preventive programs that can include education and awareness about safety measures in driving, health hazards of abused substances and the legal punishment for those abusing drugs. In addition, drug screening protocols should be established in each governorate for the most common abused drugs and including all categories of drivers.

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