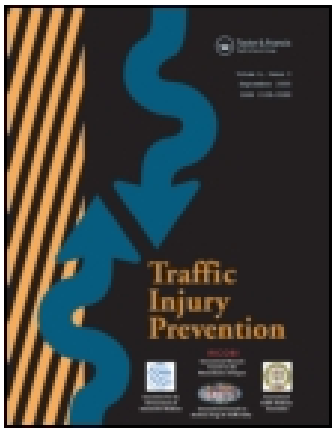

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Use of Illicit Drugs by Truck Drivers Arriving at Paranaguá Port Terminal, Brazil

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Objective: The purpose of this study was to estimate the prevalence of recent use of illicit drugs among truck drivers who had parked their vehicles at the terminal port in Paranaguá City at Paraná State, southern Brazil.

Methods: This cross-sectional study was part of a larger research project conducted among drivers at a regional Brazilian port. Data on professional characteristics, involvement in road traffic injuries, sleep, and use of alcohol and illicit drugs were collected using a questionnaire. Urine samples were collected and analyzed for amphetamines, cocaine, and cannabis using gas chromatography with mass spectrometric detection.

Results: Sixty-two drivers were included in the study. Toxicological analyses showed that 8.1 percent (95% confidence interval [CI], 2.7–17.8%) of the urine samples were positive for drugs (4.8% for cocaine, 1.6% for amphetamine, and 1.6% for both); 8.1 percent reported drug use during the preceding 30 days in the questionnaire and only one tested positive for the drug in the urine sample. No sample was positive for cannabinoids. In total, at least 14.5 percent (95% CI, 6.9–25.8%) had used illicit drugs during the preceding 30 days based on self-reports and urine testing. Drivers who reported involvement in traffic injuries the year before more often tested positive for drugs in biological samples ($P < .05$).

Conclusions: This research provides preliminary evidence that the use of illicit stimulants was common among professional truck drivers transporting grain loads. Thus, actions are needed to reduce drug use among truck drivers in order to prevent drug-related road traffic injuries.

Keywords: drugs, driving under the influence, truck drivers, urine, port terminal

Introduction

The number of road traffic injuries has reached alarming levels and is an important public health problem worldwide. More than 1.2 million people die annually because of road traffic injuries and an estimated 20–50 million people are injured (World Health Organization 2004). Brazil is no different; vehicle-related injuries cause 37,000 deaths every year and a collision involving professional truck drivers occurs every 5 min, resulting in annual losses of US$4 billion (IPEA 2003; Oliveira et al. 2012).

The main risk factors involved are driving under the influence of alcohol or drugs, fatigue, young age, speed, and road-related factors (World Health Organization 2004). The use of drugs, medicines, and/or alcohol by injured drivers has been the subject of research in Brazil (Alves 2005). Some studies have been designed and randomized roadside drug testing has been implemented to understand the use of illicit drugs by truck drivers (Leyton et al. 2012; Pechansky et al. 2009; Yonamine et al. 2013). However, the verification of driving under the influence of drugs is considered a more complex task than that of driving under the influence of alcohol (Davey et al. 2007).

There are few studies in Brazil on the use of psychoactive substances by truck drivers, especially the analysis of biological samples. In 4 studies that identified the use of these drugs in biological samples (urine or saliva), amphetamines proved prevalent in positive samples (Leyton et al. 2012; Pechansky et al. 2010; Takitane et al. 2013; Yonamine et al. 2013), ranging from 0.64 percent (Yonamine et al. 2013) to 10.8 percent (Takitane et al. 2013). Also in Brazil, more recent studies evaluating the use of psychoactive drugs through self-report found that amphetamines are the most frequently used drug

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type (Knauth et al. 2012; Leyton et al. 2012; Masson and Monteiro 2010; Nascimento et al. 2007; Souza et al. 2005; Takitane et al. 2013).

In fact, trucks dominate the transport industry in Brazil; all final goods and services are transported along the highways, which account for 1,700,000 km of the roadways. Further, the workload of the professional truck driver is high, the working hours have just been regulated (Federative Republic of Brazil 2012) but the law is not properly enforced, and some do not have adequate breaks for rest or meals (Arnold et al. 1997; Costa et al. 2003; Mello 2000), which may encourage the use of psychoactive drugs, causing damage to workers' health (Neri et al. 2005). This study aimed at estimating the prevalence of recent illicit drug use by truck drivers arriving at the terminal port in the city of Paranaguá in Paraná State by using a questionnaire and drug tests in urine samples.

Methods

Study Design

This cross-sectional descriptive study was part of a larger research project that investigated 670 truck drivers at a Brazilian port to determine substance use and previous involvement in road traffic injuries.

Study Setting

This study was conducted at the Port of Paranaguá, Paraná, southern Brazil, in July 2012. The port is the largest grain port in Latin America and one of the largest centers of maritime trade in the world (ANTAQ 2010). Among the main cargoes handled are soybean, soybean meal, corn, salt, sugar, fertilizers, containers, frozen foods, petroleum, alcohol, and vehicles. In 2012, approximately 350,000 trucks carrying corn, soybean, and soybean meal circulated in the selection yard of the Port of Paranaguá.

Volunteers and Procedures

Truck drivers parked in the selection yard of the Port of Paranaguá, Paraná, Brazil, for unloading grains (corn, soybean, and soybean meal) were asked by the researchers to participate in this research on the use of alcohol and drugs by truck drivers and previous involvement in road traffic injuries. All grain-loaded trucks going to the Port of Paranaguá pass through the selection yard.

An interview was conducted using a questionnaire investigating sociodemographic information, consumption of alcoholic beverages, practices and professional characteristics (distance of previous trip while working as a driver, time spent working as a driver, vehicle ownership, form of income, work shift), involvement in traffic injuries and near traffic injuries, hours of sleep, and self-reported sleep quality. A self-completed questionnaire on recent use of illicit drugs (amphetamines, cocaine, crack cocaine, cannabis, and heroin) within the preceding 30 days was also employed.

Study participants (670) were selected by convenience sampling (Dörnyei 2007). Because the input and allocation of drivers in the marshalling yard was not systematic, one in 3 ($n = 225$) were asked to provide a urine sample for testing for the presence of psychoactive substances. Of those, 62 agreed to provide urine samples. To guarantee the confidentiality of the volunteers, questionnaires and urine collection tubes were only identified with a code number. This study was approved by the Ethics Committee of the Universidade Estadual de Londrina. Before the interview and provision of urine samples, respondents were informed about the research objectives and provided written informed consent.

Sample Collection and Analyses

Urine samples were collected using plastic (polypropylene) collection tubes, and the samples were cooled to approximately 4°C until they were analyzed a few days later. The pH and urinary density were measured. All samples collected were screened for amphetamines, benzoylecgonine, and cannabinoids. The screening test was carried out through an automatic enzymatic immunoassay using Dimension RXL, MAxx (Siemens Healthcare Diagnostics Inc., Newark, DE). The cutoffs used for screening of amphetamines, benzoylecgonine, and cannabinoids were 1000, 300, and 50 ng/mL, respectively. The confirmation test was performed by gas chromatography–mass spectrometry (model 6850, MSD (mass spectrometry detector): model 5975; Agilent Technologies, Wilmington, DE) using previously published methodologies (Gjerde et al. 1993; Scheidweiler and Huestis 2006; Yonamine et al. 2002) with cutoffs of 500 ng/mL for amphetamine, 150 ng/mL for benzoylecgonine, and 15 ng/mL for delta-9-tetrahydrocannabinol-9-carboxylic acid (Hall and Henry 2006; Kalant 2001).

Statistical Analyses

The processing and data analysis were conducted using the software Epi Info Version 3.5.3 (Centers for Disease Control and Prevention, Atlanta, GA) for Windows. Basic descriptive statistics were performed, including percentage frequency and means. For the association analysis, chi-square or Fisher's tests were used.

Results

Of the drivers who participated in the larger study, 62 provided urine samples for testing (9.3% of the participants in the study and 27.6% of those invited to provide a urine sample). Of these, 43.5 percent were aged less than 40 years (median: 41.5) and 24.2 percent had less than 4 years of formal study.

Most drivers (67.7%) had traveled more than 500 km on the previous trip. More than two thirds of the drivers had been working in the profession for more than 10 years, did not own their own truck, and were paid only according to their productivity. Nearly 30 percent of the drivers often drove during the night (Table 1).

Table 1. Distribution of drivers according to professional practices and characteristics, Port of Paranaguá, Paraná, Brazil, 2012

	n	%
Distance covered during the previous trip		
Below 500 km	20	32.3
501 to 1000 km	19	30.6
Above 1000 km	23	37.1
Time spent working as a driver		
Below 2 years	1	1.6
2 to 10 years	16	25.8
Above 10 years	45	72.6
Own truck		
Yes	20	32.3
No	42	67.7
Type of income		
Fixed	9	14.5
Productivity	48	77.4
Fixed + Productivity	5	8.1
Work shift		
Mostly night	7	11.3
Night and day, similar proportions	11	17.7
Mostly day or just day	44	71.0

Of the drivers evaluated, 33.9 percent had been involved in road traffic accidents and, of these, 23.8 percent had been involved in road traffic injuries within the last year (8.1% of the total truck drivers). More than 40 percent reported nearly having road traffic injuries within the previous year. The majority (93.6%) of drivers reported sleeping 6 h or more per 24 h with sleep quality that was very good or good (82.3%; Table 2).

Alcohol consumption was reported by 53.2 percent (95% confidence interval [CI], 40.1–66.0%) of the subjects, with just over 54.5 percent of these drivers reporting occasionally consuming alcoholic beverages (1–3 days per week). Beer consumption was reported by all truckers and caipirinha and brandy by 9.6 and 3.2 percent, respectively. In the previous 30 days, 8.1 percent (95% CI, 2.7–17.8%; $n = 5$) of the drivers reported using psychoactive drugs, with amphetamines being the only substance reported ($n = 5$).

Table 2. Distribution of drivers according to involvement in crashes and sleep characteristics, Port of Paranaguá, Paraná, Brazil, 2012

	n	%
Traffic crashes during profession		
Yes	21	33.9
No	41	66.1
Traffic crashes within the previous year		
Yes	5	8.1
No	57	91.9
Involvement in a near traffic crash		
Yes, within the previous 30 days	19	30.6
Yes, between the previous 31 and 365 days	8	12.9
No	35	56.5
Hours of sleep per 24 h		
Up to 6 hours	4	6.5
6 to 8 hours	52	83.9
Above 8 hours	6	9.7
Self-reported sleep quality		
Very good or good	51	82.3
Regular	10	16.1
Poor	1	1.6

Table 3. Urine samples positive for drugs and recent drug use (urine samples positive for drugs or cases who admitted to recent drug use), involvement in traffic crashes, near crashes, and alcohol consumption, Port of Paranaguá, Paraná, Brazil, 2012

Variables	Total	Drugs found in urine *n* (%)	Recent drug use *n* (%)
Traffic crashes during profession			
Yes	21	2(9.5)	5(23.8)
No	41	3(7.3)	4(9.8)
Traffic crashes within the previous year			
Yes	5	2(40.0)*	2(40.0)
No	57	3(5.3)	7(12.3)
Near traffic crashes within the previous 30 days			
Yes	19	1(5.3)	2(10.5)
No	43	4(9.3)	7(16.3)
Near traffic crashes within the previous 365 days			
Yes	27	2(7.4)	4(14.8)
No	35	3(8.6)	5(14.3)
Alcohol consumption			
Yes	33	3(9.1)	6(18.2)
No	29	2(6.9)	3(10.3)

*$P < .05$.

The toxicological analysis showed that 5 (8.1%; 95% CI, 2.7–17.8%) drivers had positive samples: 3 positive for cocaine, one positive for amphetamine, and one positive for polydrugs (cocaine and amphetamine). None of the samples were positive for cannabinoids. Importantly, only one driver who had a positive sample reported having consumed any psychoactive drug in the previous 30 days. Thus, the recent use of these substances (previous 30 days), identified by self-reports or using biological samples, was noted in 9 (14.5%; 95% CI, 6.9–25.8%) drivers.

Table 3 shows that drivers who reported involvement in traffic injuries the year before more often tested positive for drugs in biological samples ($P < .05$). Although not significant, the recent use of psychoactive substances (positive or biological sample reported use in the previous 30 days) was also higher for drivers who reported involvement in traffic injuries while working ($P = .207$) and in the previous year ($P = .149$) and alcohol consumption ($P = .207$).

Discussion

Driving under the influence of psychoactive substances (illicit drugs and certain medicines/licit drugs, in addition to alcohol) increases the risk of road traffic injuries and injuries or fatalities; this problem is frequently observed worldwide in the transportation industry (Logan and Osselton 2004). Under current regulatory systems in the European Union and in many other countries, there are legal limits for the blood levels of these substances for drivers, but law enforcement for driving under the influence of drugs is a complex issue (Veisten et al. 2013).

In Brazil, there are legal limits only for driving under the influence of alcohol. In addition, the Brazilian law allows drivers

to refuse to provide samples for toxicological analysis, which impairs the identification of drivers under the influence of these substances. Results from previous studies also suggest that drug use is fairly common among Brazilian truck drivers. Silva et al. (2003) conducted a study in 3 out of the 5 geographical regions of Brazil. A total of 728 urine samples were collected (517 in the southeast, 161 in the northeast, and 50 in the southern region) and of these, 41 samples (5.6%) tested positive for drugs. The frequency of positive samples was quite similar for the 3 regions.

In another randomized roadside drug test study conducted in São Paulo state by Leyton et al. (2012), 452 urine samples from truck drivers were analyzed and 9.3 percent tested positive for drugs. Amphetamines were present in 5.8 percent of the total samples, cocaine in 2.2 percent, and cannabis in 1.1 percent. Only one sample was positive for a combination of drugs (amphetamine and cocaine; 0.2%). Yonamine et al. (2013) analyzed oral fluids from 1250 truck drivers who volunteered to participate in a randomized roadside drug test performed on highways in São Paulo state. Of the samples analyzed, 39 (3.1%) of the oral fluid samples collected were positive for the evaluated substances. Alcohol was present in 1.4 percent of the total samples analyzed, amphetamines in 0.6 percent, cocaine in 0.6 percent, and THC in 0.4 percent. One case of polydrug use (cocaine and cannabis) was identified.

Urinalysis is an important tool to verify the use of psychoactive drugs. However, a positive result does not necessarily mean that the driver was under the influence of the drugs at the time of collection. The detection of drugs in the urine implies that the drugs were used within hours or days before collection (Council on Scientific Affairs 1987; Ponce and Leyton 2008; Russell et al. 2008; Treadwell and Robinson 2007). In the present study, the toxicological analysis showed that 8.1 percent of samples were positive for drugs. In fact, the study indicates that the incidence of drug use in truck drivers at a terminal port in Brazil is very similar to that reported in other previously published studies (Knauth et al. 2002; Nascimento et al. 2007; Pechansky et al. 2010; Takitane et al. 2013); however, use of cannabis was not observed in our study.

Gjerde et al. (2012) observed in a Norwegian study that the percentage of drivers whose oral fluids tested positive for alcohol or drugs was very low (alcohol: 0.1%; amphetamine: 0.2%; cannabinoids: 0.7%; cocaine: 0.8%). This may be a result of more frequent monitoring of vehicles at checkpoints and severe punishment for driving under the influence of alcohol or drugs in Norway (Gjerde et al. 2012). In addition, drivers are not entitled to refuse random breath testing or evidential breath testing or blood sampling in cases of suspected driving under the influence of alcohol or drugs.

Cocaine was the most commonly found drug in the present study. The recent restriction on the legal marketing of amphetamines (Federative Republic of Brazil 2011) might have led to a search for other stimulating substances among previous users of amphetamines. Many truck drivers have used stimulants to help them cope with the long working hours and high workload. Cocaine is an easily obtained stimulating substance, which is also used recreationally and can increase sociability (Lizasoain et al. 2001), which again may stimulate consumption.

In fact, the rate of drug use among truck drivers in Brazil is quite high (Campos et al. 2008; Oliveira et al. 2012; Takitane et al. 2013), and the present Brazilian traffic code states that "driving under the influence of alcohol or any other psychoactive substances that cause dependence" is a serious offense (Federative Republic of Brazil 1997). Except for alcohol, the law does not specify legal limits and does not specify which drug class or specific substances are prohibited; the law merely says "substances that cause dependence" (Federative Republic of Brazil 1997). Nevertheless, only breath testing for alcohol has been used at checkpoints on highways and streets. In fact, the results of this study demonstrate that drug use among truck drivers is a concern, and more intense and judicious observation of traffic is needed to promote improved road safety in Brazil (Yonamine et al. 2013).

The research results also show a relationship between involvement in traffic injuries and positive results for psychoactive substances among truck drivers, resembling a study by Nascimento et al. (2007), which identified that self-reported consumption of amphetamines was associated with involvement in traffic injuries, and other studies that claim such a relationship (Gjerde et al. 2012; Leyton et al. 2012; Riva et al. 2010). These results confirm that there is a need to fight the use of illicit drugs among truck drivers.

This study had a low number of participants and sampling was conducted by convenience, which might have hampered the comparison of results with other studies and caused a bias in the results observed. However, the results are similar to other studies conducted in Brazil; it is therefore believed that there was no under- or overestimation of the results, especially with regard to the analysis of biological samples. Thus, it is expected that the methodological weaknesses of this study (low number of participants and selection procedure) did not affect its conclusions. Moreover, to the authors' knowledge, this is the first study reporting drug use by truck drivers at a port terminal, which denotes that the observed results may be important when analyzing this population group. In short, the identification of substance use in a subsample of volunteer drivers draws attention to the need to strengthen measures to reduce the use of illicit drugs among truck drivers. Furthermore, it is important to investigate the factors associated with the consumption of these drugs by truck drivers, whether occupational, contextual, or individual, in order to identify preventive actions aimed at subgroups that could most benefit from them.

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