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Prevalence of psychoactive substances, alcohol and illicit drugs, in Spanish drivers: A roadside study in 2015

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ABSTRACT

A survey was conducted during 2015 to monitor psychoactive substance use in a sample of drivers in Spanish roads and cities. Traffic police officers recruited drivers at sites carefully chosen to achieve representativeness of the driver population. A brief questionnaire included the date, time, and personal and driving patterns data. Alcohol use was ascertained through ethanol breath test at the roadside and considered positive if concentrations >0.05 mg alcohol/L were detected. Four drug classes were assessed on-site through an oral fluid screening test that, if positive, was confirmed through a second oral fluid sample at a reference laboratory. Laboratory confirmation analyses screened for 26 psychoactive substances. To evaluate the association between drug findings and age, sex, road type (urban/interurban), and period of the week (weekdays, weeknights, weekend days, weekend nights), logistic regression analyses were done (overall, and separately for alcohol, cannabis and cocaine).

A total of 2744 drivers, mean age of 37.5 years, 77.8% men, were included. Overall, 11.6% of the drivers had at least one positive finding to the substances assessed. Substances more frequently testing positive were cannabis (7.5%), cocaine (4.7%) and alcohol (2.6%). More than one substance was detected in 4% of the subjects. The proportion of positive results decreased with age, and was more likely among men and on urban roads. The pattern for alcohol use was similar but did not change with age and increased among drivers recruited at night. Cannabis was more likely to be detected at younger ages and cocaine was associated with night driving.

Alcohol use before driving has decreased over the last decade; however, the consumption of other illegal drugs seems to have increased. The pattern of illegal psychoactive substance observed is similar to that declared in surveys of the general population of adults.

1. Introduction

Road traffic accidents constitute an important health burden worldwide. This problem was highlighted by a report from the WHO in 2004. It is estimated to be increasing, particularly in low-income countries [1]. To overcome this burden, in Europe a target of significantly reducing road traffic fatalities (50% fewer deaths on the road in the period 2002–2010) was set [2]. In order to attain it, various initiatives have been implemented. As one of the major factors affecting driving performance is the consumption of psychoactive substances, in the EU there was a need to assess the prevalence of driving under the influence of alcohol and other psychoactive drugs and medicines. The EU funded DRUID project (Driving Under the Influence of Drugs, Alcohol and Medicines) was initiated in 2006 [3], and included the use of roadside drug testing equipment by the police. Spain was a partner in the DRUID project and a survey among drivers was performed in 2008 [4].

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To continue monitoring the situation and in order to assess actions taken, a new survey was conducted in 2013 [5] and repeated in 2015, within the Spanish Research Plan on Road Safety and Mobility 2013–2016 [6]; the so-called "*Estudio sobre la prevalencia del consumo de sustancias psicoactivas en conductores de vehiculos de España-EDAP" [Prevalence study of psychoactive substances use among Spanish drivers].*

From the law enforcement point of view, it would be necessary to consider whether roadside screen tests for substances other than alcohol, have an adequate validity. On-site tests for oral fluid are considered an effective and non-invasive method to detect drug-use, but some problems of sensitivity for substances still remain [7,8]

The aim of the present study was to assess the prevalence of alcohol and illicit drugs use, and selected psychoactive substances beyond those tested at the roadside, through analyses of oral fluid and breath-tests in a representative nationwide sample of the general population of drivers in Spain. A secondary aim was to assess sensitivity and specificity of the roadside device used (Dräger DrugTest®).

2. Methods

An observational study among drivers of motor vehicles (bicycles and vehicles over 3500 kg were excluded) on public roads in Spain was conducted in 2015. To obtain a representative sample nationwide, a multistage method was applied to select 128 *police control sites*. In the first stage, the country was divided in four *Areas* ("Cantábrica", "Norte", "Mediterránea", and "Sur"). In a second step, within each of these four areas, four population stratums according to cities' population sizes (less than 10,000 inhabitants, 10,000–99,999 inhabitants, 100,000–499,999, and 500,000 inhabitants and over) were defined, in each of which two *sectors*, one urban the other interurban, were considered; in each combination of stratum and sector, four zones were randomly selected, resulting in a total of 32 *zones*. The third step involved choosing four roadside check points in each zone according to predefined selection criteria for each sector (urban/interurban), allowing the selection of 128 roadside check points, or *police control sites*. Finally, in each one of them, the number of police control actions and the quota of drivers to be recruited per action was determined based on the population size. Control actions were planned in four spring (interurban) and four autumn (urban) weeks. Four periods were selected within those weeks, considering different days of the week and hours of the day (a) Monday–Friday from 7:00 to 23:59 h (weekdays); (b) Tuesday–Friday from 0:00 to 6:59 h (weeknights); (c) Saturday, Sunday and holidays from 7:00 to 23:59 h (weekend days); (d) Saturday, Sunday, Monday and holidays from 0:00 to 6:59 h (weekend nights).

2.1. Driver recruitment and data collection

Drivers of either Spanish or foreign nationality were recruited by a traffic police officer at the *police control site* when space was available for a vehicle to be stopped at the site. According to Spanish legislation, participation in roadside police controls is mandatory; thus participation rate was 100%. After informing the driver about the aim of the control and samples needed, oral fluid samples were obtained and then drivers were submitted to an alcohol breath test. Two samples of oral fluid (approximately 1 mL each) were taken using specific devices (Quantisal®, Alere Toxicology Plc, UK); one of them screened at roadside for opiates, amphetamines, cocaine and metabolites, and cannabinoids, using the Dräger DrugTest® 5000 (Dräger Safety AG & Co, Lübeck, Germany) [9]. If a positive result was obtained for at least one substance, the second sample was sent for laboratory confirmation, in a special container at a temperature between 2 °C and 8 °C, within 36 h of collection. After oral fluid collection and the alcohol breath test had been done, a research questionnaire, with a unique identifying code, was completed by traffic police officers. The following information was collected: (i) sociodemographic data (gender, age, nationality), (ii) driving patterns (type of vehicle and the driving license class), and (iii) date and time of the day. Results of the on-site oral fluid sample test (positive or negative to each of the five screened substances) and alcohol breath test (in mg/L) were also recorded. When the second oral fluid sample needed to be analyzed, identifying stickers were used to trace results anonymously.

2.2. Toxicological aspects

At the roadside, the Dräger DrugTest device was used for drug screening using the following cut-off concentrations: opiates (morphine), 20 ng/mL; amphetamines (D-amphetamine), 50 ng/mL; methamphetamine (D-methamphetamine), 35 ng/mL; cocaine (cocaine), 20 ng/mL; THC (Delta-9-THC), 25 ng/mL. Benzodiazepines were not monitored as in 2013 the Spanish government decided not to maintain them in road drug testing.

Alcohol concentration in exhaled air was measured in mg alcohol/liter by the Dräger Alcotest® (Alcotest 7110 MKIII). The breath test was considered positive if the concentration was >0.05 mg/L.

The quantitative drug confirmation test in oral fluid for 26 substances (Table 1) was performed after a solid phase extraction procedure. Extracts were analyzed by liquid chromatography coupled to tandem mass spectrometry (UHPLC–MS/MS). The concentration was calculated in neat oral fluid by using the average dilution factor specified by the manufacturer (1/4). All oral fluid samples were analyzed in the same laboratory (accredited following the ISO17025 by the national accreditation body – ENAC [Entidad Nacional de Acreditación (Spanish National Accreditation Body)] – for this kind of analyses).

Assessment of agreement between roadside (on-site drug screening test) and laboratory tests was only possible among

Table 1
Substances and cut-off concentrations in laboratory confirmation samples.

Substance	Cut-off concentrationoral fluid (ng/mL)
6-monoacetylmorphine	0.8
Alprazolam	1
Amphetamine	1.9
Benzoylecgonine	1.6
Clobazam	5
Clonazepam	1
Cocaine	1.6
Codeine	1.9
Δ^9-THC	0.4
Diazepam	5
Flunitrazepam	1
Ketamine	1.9
Lorazepam	10
LSD	1.9
MDA	1.9
MDEA	1.9
MDMA	1.9
Mescaline	10
Methadone	1.9
Methamphetamine	1.9
Morphine	1.9
Nitrazepam	5
Nordiazepam	1
Oxazepam	5
Zolpidem	1
Zopiclone	1