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Which drugs are associated with highest risk for being arrested for driving under the influence? A case–control study

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ABSTRACT

The aim of this study was to determine the association between drug type and arrest for driving under the influence of drugs (DUID) by calculating odds ratios (ORs) using a case–control design. A DUID arrest is in most cases related to aberrant or risky driving and might therefore be regarded as a proxy for a drug related traffic crash. The 'cases' were 2738 drivers arrested on suspicion of drugged driving from April 2008 to March 2009 with blood alcohol concentrations below the legal limit of 0.2 g/L; 794 were arrested due to involvement in road traffic crashes, whereas 1944 were arrested for other reasons, mainly dangerous driving, suspected impairment when stopped in traffic controls, or because of phone calls to the police from other road users or observers. The 'controls' were 9375 random drivers in normal traffic, also with alcohol concentrations below this limit. Blood samples from 'cases' and oral fluid samples from 'controls' were analyzed for 15 drugs that have legislative concentration limits in Norway, in addition to two other commonly detected psychoactive drugs. The most prevalent illicit drug in the control group was tetrahydrocannabinol (THC; 0.58%), which was also commonly found in samples from drivers arrested due to road crash (15.6%) or arrested for other reasons (21.8%). Amphetamine/methamphetamine was most prevalent among arrested drivers involved in crashes (30.6%) and drivers arrested for other reasons (56.9%), whereas only 0.18% of the control group was positive for amphetamine/methamphetamine. The single-use substances which gave highest OR for police arrest were amphetamine/methamphetamine, alprazolam, clonazepam and oxazepam. The majority of the alprazolam and clonazepam findings were probably due to non-therapeutic use of medicinal drugs purchased on the illegal market. Combinations of two or more drugs yielded higher ORs than the use of single substances; combinations of amphetamine/methamphetamine and benzodiazepines gave the highest risk.

1. Introduction

The use of alcohol and psychoactive drugs may impair driving skills, and previous studies have found significant associations between a number of psychoactive substances and increased crash risk [1–4]. Associations between alcohol and traffic crashes have been thoroughly studied, and because of high prevalence it has been possible to calculate risks as relative risks or odds ratios (ORs) for different blood alcohol concentrations (BACs) [3,5,6]. For other psychoactive substances, the knowledge about crash risk is more limited, mainly because the use of each single drug is less widespread, but also because a large proportion of drug-involved traffic crashes is related to multiple drug use. Some drugs are rapidly metabolized, so a blood sample taken some time after the crash does not always indicate the blood drug concentration at the time of the accident. For some substances, such as amphetamines, there may also not be a dose response relationship [7] making assessments of risk difficult.

Alcohol or drug impaired drivers are arrested by the police for a number of reasons. According to data from the Mobile Police Service on arrested drunk drivers, the majority are apprehended because of aberrant driving seen by police patrols or observers who alert the police (Frank Schrøder, personal communication). Drivers who are waving from one side of the road to the other, straddling centre lane or lane markers, almost striking an object or vehicle,

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taking extremely wide turns, speeding, or not complying with traffic rules and regulations, constitute a risk for themselves and other road users. Neighbours, friends, relatives or other persons may call the police when they observe a known drug abuser who is driving or attempting to drive a motor vehicle, and some known drug abusers are stopped for control if observed by police patrols when driving a motor vehicle.

When a suspected alcohol or drug impaired driver is stopped in Norway, a sobriety test is performed and a blood sample is taken for alcohol or drug testing. If it is obvious that the driver is impaired by alcohol, an evidential breath test may be taken instead of a blood sample.

In Norway, the police may stop drivers at random for breath alcohol testing without any suspicion of driving under the influence (DUI). In some of those cases, the behaviour of the driver, visual examination of the driver's eyes, or being recognized as a known drug abuser may lead to taking a blood sample for alcohol and drug analysis.

If a driver is involved in a traffic crash, the driver may be subject to blood sampling as a part of the process of obtaining evidence that will be used to determine the responsibility for the crash, even if there is no sign or indication of alcohol or drug use. Samples may be taken from both suspected culpable and non-culpable drivers.

When studying the contribution of alcohol and drugs in traffic crashes, limitations include the fairly low number of fatal cases occurring each year, difficulties in including seriously injured drivers admitted to hospital for treatment because it may be impossible to obtain informed consent, and the lack of information about culpability. Injured, non-culpable drivers included in studies of injured or killed drivers will lead to under-estimation of the fraction of crashes that are drug-related and thus underestimate the association between drugged driving and crashes [8]. Other limitations, such as selection bias, low participation rate, and difference in geographical areas for 'cases' and 'controls' have been reported as systematic errors in other studies [9].

Arrest for drunken or drugged driving is in most cases related to aberrant or risky behaviour in road traffic. It might therefore be regarded as a proxy for a single vehicle traffic crash. Using apprehended drivers that are not involved in a traffic crash as 'case' group might have the potential to overcome some of the problems related to culpability in previous studies of crash-involved drivers.

The aim of this study was to determine the association between drug type and arrest for driving under the influence of drugs (DUID) by calculating ORs using a case–control design. Arrested drivers were disaggregated into two types: arrest due to involvement in a traffic crash and arrests for other reasons, which in most cases was related to observed aberrant or risky behaviour in road traffic.

2. Methods

2.1. Study design and setting

In this case–control study, 'cases' were drivers arrested by the police on suspicion of driving under the influence of drugs. Blood samples were taken for analysis of alcohol and drugs. Samples with BACs above the legal limit of 0.2 g/L were excluded from this study, even if the sample was found to be positive for drugs. 'Controls' were random car and van drivers from selected areas in south-eastern, south-western, middle and northern Norway. The areas included both some of the largest cities in Norway and representative rural areas. The study was approved by the Regional Committee for Medical and Health Research Ethics, the Higher Prosecution Authority and the Council for Confidentiality and Research of the Norwegian Ministry of Justice.

2.2. Selection of 'cases'

Blood samples from drivers arrested by the police on suspicion of drugged driving are sent to the Norwegian Institute of Public Health in Oslo for drug and alcohol analysis. All blood samples from drivers arrested from April 2008 to March 2009 were included in this study. A requisition form was submitted together with the blood samples. The police filled in the name of the driver, the national identification number or date of birth, time and place for the apprehension, whether or not the driver had been involved in a traffic crash and more information. The samples were divided into two groups: (1) samples from drivers involved and (2) not involved in road traffic crashes.

2.3. Selection of 'controls'

Random drivers in normal road traffic were selected from April 2008 to March 2009 using a stratified multi-stage cluster sampling procedure. In the first stage, representative police districts were chosen. In the second stage, random road sites and time intervals were selected. The third stage consisted of randomly stopping drivers. The data collection was carried out in collaboration with the National Mobile Police Service, which stopped random cars and vans, performed breath alcohol testing or control of drivers licence. We were not allowed to include results of breath alcohol testing in our study; instead we analyzed alcohol in samples of oral fluid.

Afterwards the drivers were sent to study team members who informed about this voluntary and anonymous collection of oral fluid for alcohol and drug testing. After an informed consent was obtained, a sample of oral fluid was taken and a questionnaire filled in. Participating drivers did not receive any reward for taking part in the survey. The study of random drivers was done as a part of the DRUID Project (Driving under the Influence of Drugs, Alcohol and Medicines; www.druid-project.eu), and more details are presented elsewhere [10].

2.4. Biological samples

Blood samples from drivers ('cases') were collected shortly after arrest by using 5 ml Vacutainer® tubes containing sodium fluoride and heparin (BD Vacutainer Systems, Belliver Industrial Estate, Plymouth, UK). Blood samples were kept at 2–8 °C from the arrival at the Norwegian Institute of Public Health in Oslo until the analyses had been performed, normally within 4 weeks, and thereafter frozen at about −20 °C. The blood samples were handled using normal routine procedures for forensic toxicology analysis.

Samples of oral fluid from random drivers ('controls') were collected using Statsure Saliva Sampler™ (Statsure Diagnostic Systems, Framingham, MA, USA). The samples were kept in a bag at a temperature of approximately 5 °C until frozen the same day or next morning.

2.5. Analysis of alcohol and drugs

Blood samples from all 'cases' were screened for alcohol using an enzymatic method [11] and quantified with gas chromatography [12]. The blood samples were screened for medicinal or illicit drugs using an immunological method [13] and/or high-performance liquid chromatography with mass spectroscopy detection (LC–MS) [14,15]. Drug findings were confirmed and quantified using gas chromatography with mass spectroscopy detection (GC–MS) or LC–MS using accredited forensic toxicology methods. Analytical results for diazepam and morphine were deleted in crash 'cases' where we suspected or knew that those drugs were given as part of treatment after the accident.