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Trends in driving under the influence of drugs: A register-based study of DUID suspects during 1977–2007

Karoliina K. Ojaniemi[a,*], Tomi P. Lintonen[b,c], Antti O. Impinen[a], Pirjo M. Lillsunde[a], Aini I. Ostamo[a,c]

[a] National Public Health Institute, Department of Mental Health and Alcohol Research, Mannerheimintie 166, 00300 Helsinki, Finland
[b] Police College of Finland, PO Box 123, 33721 Tampere, Finland
[c] Tampere School of Public Health, 33014 University of Tampere, Finland

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ABSTRACT

Our aim was to describe the incidence and trends of driving under the influence of drugs (DUID) and to examine the main drug findings and their trends in suspected DUID cases in Finland. A register-based study was conducted of all suspected DUID cases during 1977–2007. The data included 31,963 DUID offenders apprehended by the police with a positive finding for illicit/licit drug impairing driving performance. Toxicological results were analyzed in blood and/or urine specimens in one central laboratory. The incidence of suspected DUID cases increased 18-fold during 1977–2007. Most of the suspects were men (89.7%). However, the male–female ratio decreased from 13.9 to 7.3. The mean age decreased from 36.2 years in 1977 to 29.9 years in 2001 but has since reincreased. Most often found substances were benzodiazepines (75.7%), amphetamines (46.0%), cannabinoids (27.7%) and opioids (13.8%). Most common illicit drugs, amphetamines and cannabinoids, started to appear at the end of the 1980s. Poly-drug findings were common (77.1%). Suspected DUID cases have increased sharply after the introduction of a zero tolerance law, especially in regard to amphetamines. DUID is an increasing problem in Finland, and needs serious attention.

1. Introduction

Driving under the influence of drugs (DUID) is a significant and increasing public health and road traffic safety related problem (Drummer et al., 2003; Mura et al., 2006; Schwilke et al., 2006). Illicit drugs (e.g. amphetamines, cannabis and cocaine) and some psychoactive medicines (e.g. benzodiazepines) have been shown to impair driving skills or increase the risk of traffic accident (Bachs et al., 2006; Bramness et al., 2002; Dussault et al., 2001; Gustavsen et al., 2006; Movig et al., 2004; Ogden and Moskowitz, 2004; Ramaekers et al., 2004). Multiple drug use and drugs combined with alcohol are quite common among DUI offenders (Augsburger and Rivier, 1997; Smink et al., 2001), posing a considerable threat to traffic safety.

In the general driver population in Europe the prevalence of illicit drug use has been estimated to be 1–5% and the prevalence of licit drugs with an impairing effect on driving performance 5–10% (Walsh et al., 2004). Among drivers suspected of DUID the prevalence of 9–57% for cannabis, 8–42% for opiates, 1–20% for amphetamines and 14–74% for benzodiazepines has been found (Walsh et al., 2004). Amphetamines, benzodiazepines and cannabis are common findings in driving impairment cases in the Nordic countries (Christophersen et al., 1999; Lillsunde, 1998, 2000). The prevalences vary due to e.g. different methodologies used, whether the samples analyzed are urine or blood and the level of awareness and activity of the police (Walsh et al., 2004).

In motor vehicle accidents 5–25% of the drivers have been under the influence of drugs (Kelly et al., 2004). Prevalence of 2–32% for cannabis, 3–5% for opioids, 2–6% for amphetamines, 4–11% for cocaine and 2–15% for benzodiazepines has been found (Kelly et al., 2004). A Finnish study concerning the role of drugs in traffic accidents estimated that diazepam may have been a contributory factor in 1–5% of the accidents (Honkanen et al., 1980). From 1989 on, an average of nine persons per year have died in DUID cases in Finland (population 5.3 million in 2007), which is circa one-tenth of all fatal accidents involving drugs/alcohol. The proportion of deaths in DUID cases has increased nearly threefold from 1993 to 2002 (Rajalin, 2004).

Most of the studies about DUID concern accident-involved drivers or drivers suspected of impaired driving and only a limited amount of studies concern general prevalence (Kelly et al., 2004). Trends in DUID have been studied at least in Norway and in Sweden (Christophersen and Morland, 1997; Holmgren et al., 2007; Jones,

* Corresponding author. Tel.: +358 40 5312529; fax: +358 9 47448478.
E-mail address: karoliina.ojaniemi@ktl.fi (K.K. Ojaniemi).

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2005; Jones et al., 2008). The aims of this study were (1) to describe the incidence and trends of DUID in men and women in different age groups and (2) to examine the main drug findings and their trends in suspected DUID cases by gender and age in Finland during 1977–2007.

2. Materials and methods

Persons suspected of driving under the influence of illicit and/or medicinal drugs potentially harmful for traffic safety were defined as DUID suspects in this study. All drivers suspected of DUID during 1977–2007, aged 10–84 years, who were driving a motor vehicle in road traffic and whose blood and/or urine sample analyzed had one or more positive findings for illicit and/or medicinal drug impairing driving skills, were included into the analysis. The focus was explicitly on DUID; cases with alcohol findings were included only when drugs were involved. In addition the cases with no drug findings potentially harmful for traffic safety despite suspicion were excluded. The data were examined as cases, not individuals, and thus the same person could turn up in the data set several times. The total number of cases in this data was 31,963. The data analyzed were divided into three age groups: 10–29, 30–49 and 50–84 years old.

Random checks, impaired or dangerous driving, traffic accidents or information from a bystander are the main reasons for detecting drugged drivers. In Finland the police are authorized by law to submit drivers to the preliminary test (alcohol breath test or oral fluid on-site drug test, launched in 2003) even without suspicion of drunken/drugged driving. In cases of suspicion of DUID external symptoms of drug use must be documented by the police. At the request of the police blood (and urine) samples are taken and a clinical sobriety test by a physician is conducted (Lillsunde and Gunnar, 2005).

All drug/alcohol analyses are carried out centrally at the Drug Research Unit at National Public Health Institute (KTL) of Finland. The drugs analyzed at KTL and included in the study are presented in Table 1. Until the introduction of the zero tolerance law for illicit drugs and driving in Finland in February 2003 (Ministry of Justice Finland, 2001) the drugs were screened in urine (Lillsunde and Korte, 1991a) or in blood (Lillsunde et al., 1996). After 2003 drugs are screened in blood only (Gunnar et al., 2004). During the study period of 30 years several quantification methods have been used (Gunnar et al., 2005, 2006a; Gunnar et al., 2006b; Kankaanpaa et al., 2004; Lillsunde and Korte, 1991b; Lillsunde and Seppala, 1990). Information about DUID suspects is registered in a database, and has been collected since 1977. The register data containing all suspected driving under the influence of drugs cases over three decades of time were analyzed in this study. Data included age, gender, details of the case and some clinical data.

The purpose of this study was not to examine the level of impairment but to assess the amount of suspected DUID cases, and what kinds of drugs had been found among DUID suspects during the last three decades. Thus substance concentrations were not taken into account in this study. Substance findings were classified as positive or negative and all positive findings (exceeding cut-off values at a given time) included in this study. Although blood is currently considered to be the best body fluid for confirmation analysis (Augsburger et al., 2005; Morland, 2000; Walsh et al., 2004), that has not been the case during the entire study period. For example, cannabinoids were analyzed in urine samples only until 1993. For this reason the findings in urine samples only were also taken into account in this study. Furthermore the proportion of cases where bare urine samples were analyzed was very small, only 4.5% ($n = 1449$) of all the cases, while the proportions of cases analyzed from blood samples and both blood and urine samples were 55.5% ($n = 17{,}742$) and 40.0% ($n = 12{,}772$), respectively.

Individual substances were categorized under their main groups. Groups under observation were 'benzodiazepines', 'amphetamines', 'cannabinoids', 'opioids' and 'others' (drugs potentially harmful for traffic safety). The individual substances under each main group are presented in Table 1. All findings under the same main group in the same case – whether they were found from blood, urine or both, and whether they were parent drugs or metabolites – were counted as one and thus it formed one case in that main group. This kind of categorization reduces the number of poly-drug findings under the same main group, but it still reveals the poly-drug findings between different main groups.

The entire population of Finland has increased from 4.7 million in 1977 up to 5.3 million in 2007. Annual incidences of suspected DUID cases were calculated on the basis of the general 10–84-year-old Finnish population (Statistics Finland) and announced per 100,000 persons.

SPSS 15.0 for Windows was used for the statistical analysis. The statistical significance was calculated by using logistic and linear regression analyses; a P-value of ≤ 0.01 was considered statistically significant. The Institutional Review Board of the National Public Health Institute approved the study protocol.

Table 1
The drugs and medicines analyzed (either in blood and/or urine) in KTL's Drug Research Unit in suspected DUID cases in Finland.

Amphetamines	Cannabinoids
3,4-Methylenedioxymethamphetamine (MDMA)	11-Nor-delta-9-tetrahydrocannabinol-9-carboxylic acid (THCC)
Amphetamine	Delta-9-tetrahydrocannabinol (THC)
Methamphetamine	
3,4-Methylenedioxyethylamphetamine (MDEA)	
3,4-Methylenedioxyamphetamine (MDA)	
Benzodiazepines	Opioids
Diazepam	Morphine
Chlordiazepoxide	Heroin
Chlorazepate	Pethidine
Nordiazepam	Methadone
Medazepam	Alfentanyl
Oxazepam	Fentanyl
Lorazepam	Oxicodone
Temazepam	Buprenorphine
Nitrazepam	Norbuprenorphine
Flunitrazepam	Ethylmorphine
Midazolam	Propoxyphene
Triazolam	Codeine
Alprazolam	6-Monoacetylmorphine
Bromazepam	Tramadol
Benzodiazepine metabolites	
Phenazepam	Others
Clonazepam	Barbiturates
Zopiclone[a]	Other hypnotics and tranquillizers
Zolpidem[a]	Antiepileptics
	Central muscle relaxants
	Other medicines with driving impairment warning label
	Neuroleptics
	Antidepressants
	Neurological drugs
	Other illicit drugs

[a] Nonbenzodiazepines, which act on similar receptors as the benzodiazepines, and thus included in the benzodiazepines group for the purposes of this study.