



Non-natural manners of death among users of illicit drugs: Substance findings



Gerd Jorunn M. Delaveris^{a,*}, Brita Teige^a, Sidsel Rogde^{a,b}

^a Division of Forensic Medicine and Drug Abuse (DFMDA), Norwegian Institute of Public Health (NIPH), P.O. Box 4404 Nydalen, N-0403 Oslo, Norway

^b University of Oslo, The Medical Faculty, P.O. Box 1078 Blindern, N-0316 Oslo, Norway

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ABSTRACT

The aim of the study was to explore differences and similarities between the various non-natural manners of death (accident, suicide, homicide) regarding toxicological findings in illicit drug users. Medicolegal autopsy reports from the Institute of Forensic Medicine University of Oslo concerning deaths from 2000 to 2009 were investigated. Those aged 20–59 whose manner of death was non-natural and who tested positive for any narcotic drug (morphine/heroin, amphetamines, ecstasy, cannabis, LSD, PCP, and high levels of GHB in addition to methadone and buprenorphine) were selected. All substance findings were registered and categorized (narcotics, ethanol, and medicinal products). Of the 1603 autopsies that met the selection criteria, 1204 were accidental intoxications, 122 accidents other than intoxication, 114 suicides by intoxication, 119 non-intoxication suicides, and 44 victims of homicide. Poly drug use was found in all manners of death. The drug profile as well as the mean number of substances (illicit drugs and medicinal products) varied from 2.9 to 4.6 substances per case, depending on the manner of death. Intoxication suicides had the highest number of substances and a total drug profile similar to accidental intoxications. Non-intoxication suicides had a total drug profile similar to homicide and accidents other than intoxication. The number of substances found per case increased during the decade, mainly due to increased findings of methadone, cannabis, amphetamines, and benzodiazepines. Methadone findings increased much more than buprenorphine. Methadone was found 20 times more often than buprenorphine in accidental intoxication cases. In summary, poly drug findings are common in adults who suffer a non-natural death while using illicit drugs. The different manners of death have some specific characteristics and significant differences regarding drug profile.

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1. Introduction

Norway has a high prevalence of injecting illicit drug use [1] as well as of deaths due to accidental intoxication [2–4]. In spite of various preventive measures there has been no definite decline in the incidence of such deaths since a peak in 2001 [2,4]. In a Norwegian study of medicolegal autopsies spanning the years 2000–2005, we found 24% of the deceased with positive illicit drug findings did not die from accidental overdose [5]. Another study on toxicological findings in a Norwegian forensic autopsy material (2000–2009) showed a clearly

increasing number of various substances (legal and illegal) in individuals who had ingested illicit drugs [6]. This study, however, did not take into account the cause or manner of death. As non-natural deaths are preventable it is important to investigate substance findings and trends in the drug profile of illicit drug users who do not die from natural causes. For the society to be able to take relevant preventive measures regarding drug related deaths, more knowledge is needed about those who die while using illicit drugs. Hence, we wanted to explore the differences as well as the similarities regarding the total drug profile between the different non-natural manners of death (accident, suicide and homicide) in illicit drug users. Another objective was to study the drug profile in the accidental intoxications compared to suicidal intoxications in the study population. In addition, we wanted to supplement the information from a previous study from the same decade [6] regarding developmental trends in drug findings.

* Corresponding author. Tel.: +47 21077691; fax: +47 21077677.

E-mail addresses: gede@fhi.no, gerdjmd@gmail.com,

g.j.m.delaveris@medisin.uio.no (G.J.M. Delaveris), brita.teige@gmail.com (B. Teige), srog@fhi.no (S. Rogde).

2. Material and methods

2.1. Selection of cases

Medicolegal autopsy reports on deaths between 01.01.2000 and 31.12.2009 from The Institute of Forensic Medicine, University of Oslo¹ were studied. This department serves about 2.5 million people, which equals half the population of Norway. The cases selected were those whose manner of death was non-natural (accidents, suicides and homicides) and where at least one of the narcotic substances listed below, was detected in post mortem blood. Only individuals between the ages of 20–59 at the time of death were included.

2.2. Substances included

At least one of the following narcotic substances had to be present: amphetamines (methamphetamine, amphetamine), cannabis, cocaine/benzoylcegonine, ecstasy (MDMA, MDA), heroin² or morphine, phencyclidine, LSD (lysergic acid diethylamide), and GHB³ (γ -hydroxybutyric acid). The opioids methadone and buprenorphine were also included. Persons, who had received advanced health care in relation to/shortly before death and where morphine was the only narcotic substance detected, were excluded as the morphine could have been given as part of emergency medical treatment. Cases with findings of only morphine and codeine and where the concentration of codeine was higher than that of morphine were also excluded due to the possibility that the morphine finding could have been caused by intake of codeine in common prescription analgesics. The medicinal products detected were grouped as follows: benzodiazepines,⁴ antidepressants,⁵ hypnotics,⁶ analgesics,⁷ antiepileptics,⁸ and antipsychotics.⁹ Finding of ethanol was also registered.

2.3. Toxicological analyses

All the toxicological analyses were performed at the Department of Forensic Toxicology at the Norwegian Institute of Public Health. The samples were screened by immunological/enzymatic or chromatographic methods. Confirmation and quantification analyses were performed by different chromatographic methods [6].

2.4. Data collection and categorization

Electronic autopsy records were screened. Sex, age, cause and manner of death were recorded. All toxicological findings in blood were registered. A substance and/or its metabolite were counted as one substance. The cases were grouped into the following five categories according to manner of death: accidental intoxication, accident by other means (non-intoxication), suicide by

intoxication, suicide by other means (non-intoxication), and homicide. We applied the manner and cause of death given by the forensic pathologist in each individual case. Cases, in which the manner of death was registered as probable accident or probable suicide, were categorized as accident or suicide, respectively. Cause and manner of death were not compared with ICD-10 data from the National Cause of Death Registry.

2.5. Statistical analysis

The data were analyzed in the SAS 9.3 version for Windows. Cross tables and chi square test were performed to detect differences.

2.6. Permissions

The study was approved by the Regional Committee for Medical and Health Research Ethics. Approval of data collection was granted from The Director of Public Prosecutions, The National Police Directorate and Norwegian Board of Forensic Medicine.

3. Results

3.1. Demographics

Of the 9141 medicolegal autopsies performed at the Institute during the ten year period, 1603 cases were found to fulfill the selection criteria. Eighty one percent of these were males. The mean age was 34.9 years (median 34). In seventy five percent the manner of death was classified as accidental intoxication, in 8% as accident by other means, while 14% were suicides, and 3% victims of homicide (Table 1). Half of the suicides were due to intoxication. The other half was often caused by more “violent” methods like hanging, shooting or jumping from heights/ in front of trains. The highest age was found among the suicides (mean 35.3 years, median 34 for all suicides) and the lowest among the other accidents than intoxication (mean 33.3 years, median 31.5).

3.2. Number of substances detected

The numbers of different substances and substance groups detected in the deceased are presented and sorted by manner of death in Fig. 1 and Table 1 respectively. The percentage of cases testing positive for ethanol differed non-significantly (p value = 0.779) between 27 and 30 per cent among the various manners of death. The number of narcotic substances as well as the total number of substances per case showed significant differences between the various manners of death (p value < 0.001). Victims of homicide and accidental intoxication had the highest number of narcotic substances. The highest total number of substances was found among the suicides by intoxication, with a mean number of 4.6. This differed significantly (p value < 0.001) from the non-intoxication suicides which had the lowest total number. There was also a significant difference (p value = 0.0317) regarding number of narcotic substances between the two suicide groups.

3.3. Narcotic substance profile

The narcotic drug profiles in the different manners of death are given in Table 2. The opiates morphine and/or heroin (6-MAM) were found in 81% of the accidental poisoning cases and in 70% of the suicide by intoxication group. In the other manners of death morphine/heroin was detected in considerably lower proportions. The lowest proportion of opiates (17%) and opioids (<4%) were found in the group accident by other means. Methadone was found in 20% of the accidental intoxications, which is 20 times more often

¹ From June 2011 Department of Forensic Pathology and Clinical Forensic Medicine at the Norwegian Institute of Public Health (NIPH).

² Heroin intake was considered verified if 6-monoacetylmorphine (6-MAM) was detected in any of the analyzed samples (blood, urine, vitreous humor).

³ Only GHB concentrations ≥ 1000 $\mu\text{mol/l}$ were included. GHB is present in vivo in low concentration and concentrations may rise post mortem.

⁴ Diazepam, flunitrazepam, clonazepam, nitrazepam, oxazepam, fenazepam, alprazolam, midazolam.

⁵ Amitriptyline, citalopram, doxepine, fluoxetine, mianserin, mirtazapine, nortriptyline, paroxetine, sertraline, trimipramine, venlafaxine.

⁶ Zopiclone, zolpidem, alimemazine, promethazine.

⁷ Codeine, paracetamol (acetaminophen), dextropropoxyphene, fentanyl, ketamine, ketobemidone, carisoprodol/meprobamate, oxycodone, tramadol.

⁸ Phenobarbital, carbamazepine, lamotrigine, pregabalin, valproic acid.

⁹ Chlorpromazine, chlorpromazine, clozapine, levomepromazine, olanzapine, perphenazine, quetiapine, zuclopenthixole.

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