Z Rechtsmed (1989) 102:355–365

Zeitschrift für
Rechtsmedizin

Original works

Fatal intoxications in the Nordic countries

A forensic toxicological study with special reference to young drug addicts*

A. Steentoft[1], B. Teige[2], E. Vuori[3], G. Ceder[4], P. Holmgren[4], E. Kaa[5], J. Kristinsson[6], P. T. Normann[7], and J. Pikkarainen[8]

[1]Institute of Forensic Chemistry, University of Copenhagen, Frederik den Femtes Vej 11, DK-2100 Copenhagen, Denmark
[2]Institute of Forensic Medicine, University of Oslo, Rikshospitalet, N-0027 Oslo 1, Norway
[3]Department of Forensic Medicine, University of Helsinki, Kytösuontie 11, SF-00300 Helsinki, Finland
[4]National Laboratory of Forensic Toxicology, Regionsjukhuset, S-58185 Linköping, Sweden
[5]Institute of Forensic Medicine, University of Aarhus, Skovagervej 2, DK-8240 Risskov, Denmark
[6]Department of Pharmacology, University of Iceland, P.O. Box IS 1532, Reykjavik Iceland
[7]National Institute of Forensic Toxicology, P.O. Box 16 Gaustad, N-0320 Oslo 3, Norway
[8]National Public Health Institute, Mannerheimintie 166, SF-00300 Helsinki, Finland

Summary. Fatal intoxications in the 15–34 age group in the five Nordic countries during the years 1984 and 1985 (Sweden only in 1984) were investigated. The known drug addicts were studied separately. The highest incidence of intoxications, calculated per 10^5 population, was found in Finland (11.3), followed by Denmark (10.3), Sweden (8.5), Iceland (7.2) and Norway (6.6). The percentage of intoxications caused by drugs was 92 in Denmark, 71 in Norway, 66 in Sweden, 50 in Finland and 17 in Iceland. Ethanol intoxications were seen 5–7 and 2–3 times as frequently in Finland and in Iceland, respectively, than in the other three countries. Carbon monoxide intoxications accounted for two-thirds of all fatal intoxications in Iceland. Drug addicts accounted for 62% of all fatal intoxications in the Danish material. The corresponding figures were 33% in the Norwegian, 16% in the Swedish and 5% in the Finnish material. No deaths in drug addicts were found in Iceland. Most drug addicts in Denmark, Norway and Sweden died of hard drugs and most in Norway and Sweden, from heroin or morphine, whereas in Denmark

* Supported by the Nordic Council for Alcohol and Drug Research (NAD)
Offprint requests to: A. Steentoft

other strong analgesics, such as methadone, dextropropoxyphene and ketobemidone, accounted for 40% of all hard-drug-related fatal intoxications. To a certain extent the results reflect differences in the legal autopsy routines in the various Nordic countries. However, the ascertainment of drug addicts is assumed to be near-complete in each country.

Key words: Fatal intoxications – Drugs – Drug addicts

Zusammenfassung. Die Untersuchungen beziehen sich auf tödliche Vergiftungen bei 15- bis 34jährigen Einwohnern der 5 nordischen Länder im Zeitraum von 1984 und 1985 (hinsichtlich Schweden lediglich 1984). Die bekannten Drogenabhängigen wurden gesondert behandelt. Die höchste Inzidenz von Vergiftungen, jeweils auf 10^5 Einwohner bezogen, wurde in Finnland (11,3) beobachtet. Es folgten Dänemark (10,3), Schweden (8,5), Island (7,2) und Norwegen (6,6). Der prozentuale Anteil von drogenbedingten Intoxikationen betrug 92 in Dänemark, 71 in Norwegen, 66 in Schweden, 50 in Finnland und 17 in Island. Ethanolvergiftungen wurden in Finnland 5 bis 7 und in Island 2 bis 3mal häufiger gesehen als in den anderen 3 Ländern. Vergiftungen mit Kohlenmonoxid machten ⅔ aller tödlichen Intoxikationen in Island aus. Andererseits betrug der Anteil der Drogenabhängigen bei den tödlichen Vergiftungen in Dänemark 62%. Die entsprechenden Daten waren 33% in Norwegen, 16% in Schweden und 5% in Finnland. In Island gab es keine Drogentoten. Die meisten Drogenabhängigen in Dänemark, Norwegen und Schweden starben nach der Applikation von harten Drogen; in Norwegen und Schweden hauptsächlich von Heroin/Morphin. In Dänemark machten andere starke Analgetika, wie z. B. Methadon, Dextropropoxyphen und Ketobemidon 40% aller durch harte Drogen verursachten tödlichen Intoxikationen aus. Bis zu einem gewissen Grad reflektieren die aufgezeigten Unterschiede auch die im Rahmen der Routine üblichen Vorgehensweisen bei der gerichtlichen Sektion. Dennoch dürfte die Gruppe der Drogenabhängigen wohl in jedem der beschriebenen Länder fast vollständig erfaßt worden sein.

Schlüsselwörter: Tödliche Vergiftungen – Drogen – Drogenabhängige

Introduction

During the last 20 years, drug abuse among young people has been an increasing problem in most western countries [1, 2, 3], including the five Nordic countries Denmark, Sweden, Norway, Finland and Iceland. A report on the drug abuse situation in these countries, with a short survey of deaths related to drug abuse, was published in 1984 [4]. Some national reports also describe deaths in drug addicts and/or fatal intoxications due to narcotics [5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15]. However, the data presented in these reports are not easily comparable. This is in part due to lack of precise definitions of terms like "drug addicts," and "narcotics." A retrospective study of fatal intoxications in which these terms are defined was therefore initiated by Nordic forensic toxicologists.

Subjects and methods

The material consists of cases of fatal intoxication occurring in persons 15–34 years of age and submitted to medicolegal autopsy and subsequent toxicological investigation in 1984 and 1985 (for Sweden 1984 only) at any laboratories performing forensic toxicology in the Nordic countries. Deaths in which the immediate cause of death (Ia) was hypothermia or bronchopneumonia, etc., resulting from intoxication (Ic) were included in the study. Deaths by fire were excluded, even if the immediate cause of death was carbon monoxide intoxication.

All drugs and poisons detected in the cases were recorded using a standardized protocol. Cases of multiple drug intoxication, i.e. cases where the cause of death could not be attributed to a single intoxicant, were recorded as belonging to the drug group with the lowest number according to the classification rules given below. In each case, sex, age, information on drug addiction, and blood ethanol concentration (BAC) if it was equal to or greater than 0.5 mg/g, were also recorded.

The drugs and poisons were divided into the following four groups:

Group I. Drugs listed in the Single Convention on Narcotic Drugs 1961 [16], schedules I (dextromoramide, heroin/morphine, ketobemidone, methadone etc.) and II (dextropropoxyphene, pholcodine, ethylmorphine, codeine etc.).

Group II. Drugs listed in the International Convention on Psychotropic Drugs 1971, schedules I and II [17] (amphetamine, tetrahydrocannabinole, etc.).

Group III. Drugs listed in the International Convention on Psychotropic Drugs 1971, schedules III and IV [17] (most barbiturates, meprobamate, methaqualone, etc.).

Group IV. All other drugs and poisons, including ethanol and carbon monoxide. Benzodiazepines were included in this group.

In this study drug addicts were defined as persons who according to information from the police reports and/or autopsy reports were known to have abused drugs intravenously, and/or abusers of drugs listed in the Single Convention on Narcotic Drugs 1961, schedule I and/or Convention on Psychotropic Drugs 1971, schedules I and II.

The laws concerning medicolegal autopsies in the five Nordic countries are quite similar. In the Nordic countries, the police and/or the forensic pathologist request(s) a forensic toxicological investigation (1) when intoxication is suspected, (2) when a toxicological examination is necessary to explain the events leading to death and (3) when the cause of death cannot be established at autopsy. Nevertheless, medicolegal practice and the frequency with which autopsies are requested are somewhat different, as can be seen in Table 1, where the total number of deaths and of medicolegal autopsies and toxicological investigations in each country are displayed. In Finland, Sweden and Iceland medicolegal autopsies and toxicological investigations are performed in all cases of suspected acute poisoning. In Norway this is true in the larger cities, but the police may be more restricted in ordering forensic autopsies in other areas. However in cases of fatal intoxication in recognized drug addicts medicolegal autopsy is

Table 1. The number of deaths, medicolegal autopsies and toxicological investigations in the 15–34 age group in the five Nordic countries in 1984–1985

Country	Deaths	Medicolegal autopsies	Toxicological investigations
Denmark	2555	881 (34%)	651 (25%)
Sweden[a]	1609	961 (60%)	961 (60%)
Norway	1813	Not known	1052 (58%)
Finland	2701	2051 (76%)	1543 (57%)
Iceland	217	67 (31%)	67 (31%)

[a] Only 1984

mandatory throughout the country. In Denmark medicolegal autopsy and toxicological analysis are not performed in all cases of fatal poisoning, but in accordance with the Danish regulations, deaths related to abuse of narcotic drugs (mainly groups I and II) are always subjected to medicolegal autopsy and toxicological investigation.

The blood ethanol concentration is routinely determined in most cases. In all laboratories special analyses for drugs and poisons, e.g., amphetamine, cannabis, cocaine, morphine and carbon monoxide, not detected in the general screening (acid, basic, and neutral extracts of urine, liver or blood) are only performed on request or when the case history indicates such an analysis. In Finland urine from male subjects less than 35 years of age who have lived in the metropolitan area is routinely screened for cannabis and opiates.

Results

The age distributions of the fatalities are presented in Fig. 1. The distributions were similar in the Danish, Swedish and Finnish materials, showing an increasing number of intoxications with age. However, in the Norwegian material a maximum was seen in the age group 20–24 years. As to drug addicts, there were very few cases in the youngest age group (15–19 year) in all countries. In Denmark and Norway the age distribution in addicts was similar to the age distribution in all intoxications. In Sweden almost all fatal intoxications in the addicts were found in the 25–34 years age group.

None of the 12 cases of fatal intoxications in Iceland occurred in female subjects. In the other countries male subjects accounted for about 70% of all cases. For certain types of intoxications the percentage of males was even higher, e.g., 86% of acute ethanol intoxications in Finland and 80% in Norway and Sweden. The sex distribution of addicts differed slightly from the distribution observed for all drug deaths. The percentage of males was 81 in Norway, 78 in Sweden and 76 in Denmarkt, but only 64 in Finland.

The number of fatal intoxications is shown in Table 2 for all the cases and for the addicts separately. The numbers are given per 10^5 inhabitants, to make comparisons between the countries possible. The lowest rate for all intoxications was seen in Norway, followed in ascending order by Iceland, Sweden, Denmark

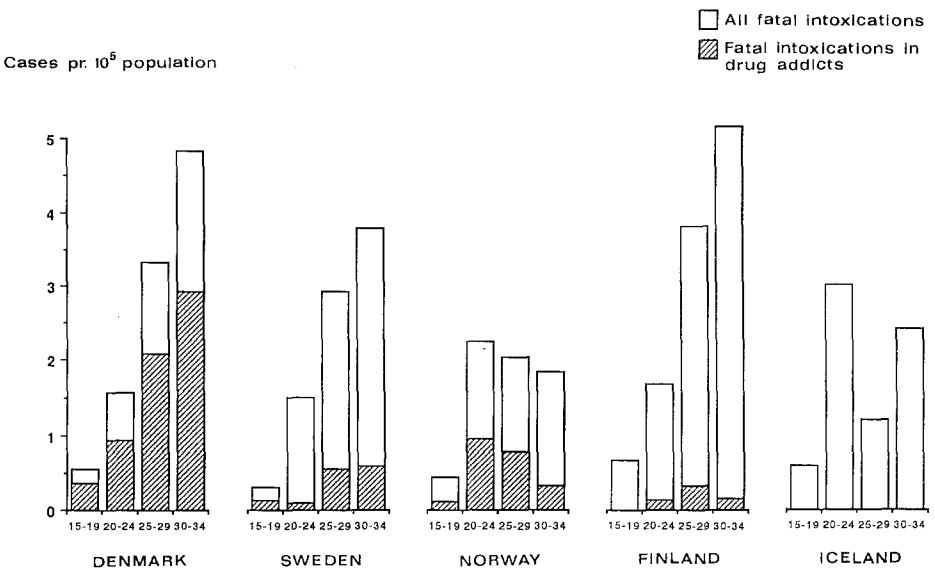

Fig. 1. Death rate acording to age in fatal intoxications (age group 15–34 years) in the Nordic countries in 1984 and 1985 (Sweden 1984 only)

Table 2. Fatal intoxications per 10^5 inhabitants (15–34 years of age) investigated in forensic toxicological laboratories in the Nordic countries in 1984 and 1985. Figures in parentheses represent the total number of fatalities in each case

	All cases				
	Denmark	Sweden[a]	Norway	Finland	Iceland
Intoxicant					
Drugs	9.5 (290)	5.6 (130)	4.7 (119)	5.6 (173)	1.2 (2)
Ethanol	0.42 (13)	0.52 (12)	0.59 (15)	2.9 (90)	1.2 (2)
Carbon monoxide	0.23 (7)	2.2 (51)	1.1 (29)	2.4 (73)	4.8 (8)
Miscellaneous	0.16 (5)	0.22 (5)	0.16 (4)	0.42 (13)	– (0)
Total	10.3 (315)	8.5 (198)	6.6 (167)	11.3 (349)	7.2 (12)
	Drug addicts				
Intoxicant					
Drugs	6.2 (191)	1.3 (31)	2.0 (52)	0.36 (11)	– (0)
Ethanol	0.10 (3)	0.04 (1)	0.08 (2)	0.13 (4)	– (0)
Carbon monoxide	– (0)	– (0)	– (0)	0.13 (4)	– (0)
Miscellaneous	– (0)	– (0)	0.04 (1)	– (0)	– (0)
Total	6.3 (194)	1.3 (32)	2.1 (55)	0.6 (19)	– (0)
Per cent addicts	62	16	33	5	0

[a] Only 1984

Table 3. Drugs and poisons found in fatal intoxications in 1984–1985 (15–34 age group). For classification, see Subjects and methods

	Denmark $n = 315$ %	Sweden[a] $n = 198$ %	Norway $n = 167$ %	Finland $n = 349$ %	Iceland $n = 12$ %
All drugs in group I					
Cause of death[b]	74.6	24.7	37.7	2.6	0
Incidence[c]	88.3	38.4	50.9	4.0	0
All drugs in group II					
Cause of death	0	1.0	0	0	0
Incidence	0.3	5.1	4.2	0.6	0
Amphetamine					
Cause of death	0	0.5	0	0	0
Incidence	0	3.0	0.6	0	0
Cannabinoles					
Cause of death	0	0	0	0	0
Incidence	0.3[d]	0	3.6[d]	0.6[d]	0
All drugs in group III					
Cause of death	4.1	5.1	3.0	12.3	0
Incidence	13.0	7.6	3.0	15.2	16.7
Barbiturates[e]					
Cause of death	3.5	5.1	1.8	11.7	0
Incidence	11.1	7.6	1.8	14.0	16.7
All drugs in group IV					
Cause of death	13.3	34.8	30.5	34.7	16.7
Incidence	42.5	127.3	85.6	61.0	91.7
Antidepressants					
Cause of death	3.2	9.6	16.8	6.6	0
Incidence	4.8	20.2	21.0	8.3	0
Benzodiazepines					
Cause of death	0	1.5	1.2	2.9	0
Incidence	16.8	31.3	30.5	15.8	41.7
Neuroleptics					
Cause of death	1.3	6.6	5.4	12.6	8.3
Incidence	2.9	22.2	16.8	20.4	16.7
Orphenadrine					
Cause of death	1.6	7.6	2.4	0	0
Incidence	2.9	7.6	2.4	0	0
Carbon monoxide					
Cause of death	2.2	25.8	17.4	20.9	66.6
Incidence	2.2	25.8	17.4	20.9	66.6
Ethanol					
Cause of death	4.1	6.1	9.0	25.8	16.7
Incidence	42.2	40.9	36.5	60.7	41.7
Miscellaneous					
Cause of death	1.6	2.5	2.4	3.7	0
Incidence	1.6	2.5	3.0	4.0	0
Total					
Cause of death	100	100	100	100	100
Incidence	190	248	201	166	217

[a] Only 1984
[b] Cases (%) in which drugs in a given group are considered the main cause of death
[c] Cases (%) in which drugs in a given group have been detected
[d] Identified in the urine
[e] Aprobarbital belongs to group IV

Table 4. Fatal intoxications caused by drugs in Group I. For classification, see Subjects and methods

	Number of cases in				
	Denmark	Sweden[a]	Norway	Finland	Iceland
Codeine					
All cases	0	0	6	2	0
Addicts	0	0	1	2	0
Dextromoramide					
All cases	1	0	0	0	0
Addicts	1	0	0	0	0
Dextropropoxyphene					
All cases	70	22	14	5	0
Addicts	23	0	4	0	0
Ethylmorphine					
All cases	0	1	4	1	0
Addicts	0	0	3	0	0
Pholcodine					
All cases	0	0	1	0	0
Addicts	0	0	1	0	0
Heroin/morphine					
All cases	109	24	38	1	0
Addicts	107	23	38	1	0
Ketodemidone					
All cases	18	0	0	0	0
Addicts	12	0	0	0	0
Methadone					
All cases	37	2	0	0	0
Addicts	35	2	0	0	0
All cases in group I	235	49	63	9	0
Drug addicts in group I	178	25	47	3	0
Per 10^5 population					
All cases in group I	7.7	2.1	2.5	0.3	0
Drug addicts in group I	5.8	1.1	1.9	0.1	0

[a] Only in 1984

and Finland. No cases of fatal intoxication in drug addicts was observed in Iceland, few in Finland and more in Sweden, Norway, and Denmark in ascending order of frequency. The incidence of addict deaths was 3–5 times higher in Denmark than in Norway and Sweden (Table 2).

Table 3 gives the frequencies of drugs and poisons as the cause of death and the rate of detection. The intoxicants were divided into four groups. Group I (hard) drugs were responsible for 75% of all fatal intoxications in Denmark, 38% in Norway, 25% in Sweden, 2.6% in Finland and none in Iceland. Amphet-

amines and cannabis were the most commonly abused drugs in group II; however, this group was not important as a cause of death. Barbiturates were the group III agents most frequently found, and the number of fatal barbiturate intoxications was especially high in Finland. Multiple drug intoxications were most frequently caused by group IV drugs. The presence of benzodiazepines was a common toxicological finding, but seldom a cause of death. Antidepressants were proportionally more common in Norway, neuroleptics in Finland, and orphenadrine in Sweden than in the other countries. In Iceland carbon monoxide was the most prevalent lethal intoxicant (66.6%), whereas it was rarely detected in Denmark (2.2%).

Death caused by heroin or morphine was not an unusual finding (Table 4). Morphine was detected 109 times in Denmark, but only once in Finland during the 2-year period. Other important drugs in group I were methadone, mainly in drug addicts, and dextropropoxyphene, mainly in nonaddicts. Deaths directly caused by group I drugs were observed mainly in addicts. Some national differences were also seen: ketobemidone and dextromoramide were found only in Denmark, pholcodine in Norway, methadone in Denmark and Sweden, and codeine in Norway and Finland.

Ethanol intoxication was an important cause of death in Finland and Iceland (Table 3). In fatal drug and carbon monoxide intoxications blood ethanol concentrations equal or above 0.5 mg/g were found in about 40% of cases. However, in addicts the proportion of ethanol-positive cases was somewhat lower in Sweden, Norway and Finland.

Discussion

In a report of the narcotic situation in the Nordic countries in the late 1970s [4] the number of heavy misusers (i.e., daily or nearly daily intravenous injection of opiates) was estimated to be about 6000–10000 in Denmark and 1500–2000 persons in Sweden. It was assumed that about 3000–4500 persons had tried an intravenous injection in Norway. No data on the use of narcotic drugs were given in the report from Finland and Iceland. The present toxicological findings of addicts support the estimate that there are 3–5 times as many addicts in Denmark as in Norway or Sweden.

The number of young addicts in the Nordic countries has been a special cause for concern. Therefore, the present material is limited to fatal intoxications in persons between 15 and 34 years of age. Although the frequency of medicolegal autopsies varies from one country to another, being highest in Finland and lowest in Denmark in this age group, as a rule a fatal intoxication in a known drug addict is submitted to medicolegal autopsy and toxicological analysis in all five countries.

The number of intoxicants detected per fatality varied from 1.7 in Finland to 2.5 in Sweden. Conclusions from these ratios should be drawn with care, since the figures released depend on how comprehensive the toxicological analyses are. In Sweden, Finland and Iceland a general screening is performed in suspected cases of fatal drug intoxication. In Norway and Denmark the screening

is extended only when the drug suspected to have caused death is not found in a concentration considered to be fatal.

The rate of lethal intoxications was highest in Finland, followed by Denmark, Sweden, Iceland and Norway. Addicts accounted for 62% of all fatal intoxications in Denmark. The corresponding figures were 33%, 16% and 5% for Norway, Sweden and Finland, respectively.

In Finland, the high incidence of lethal intoxications was due to the high number of ethanol and carbon monoxide poisonings. Ethanol intoxication was somewhat more common in Finland than in Iceland, and 5–7 times as common as in the other countries. Even higher ratios were published earlier by Poikolainen [18] in a comparison of ethanol poisoning mortality in the different Nordic countries. It has also been shown that drinking habits more frequently lead to severe acute intoxication in Finland and Iceland than in Sweden and Norway [19]. Known Finnish addicts usually died of barbiturate, ethanol or carbon monoxide poisoning. Hard drugs (group I) were rare: one case with morphine and two cases with codeine. Dextropoxyphene poisoning was not an uncommon cause of death among the non-addicts.

In Denmark drug addicts accounted for about two-thirds of all fatal intoxications in this age group. This high figure is due to two facts: Denmark has the highest number of drug addicts of all Nordic countries [4], and medicolegal autopsy and toxicological analysis are not performed in all cases of other fatal poisonings. However, when known narcotics abusers die medicolegal autopsy and toxicological investigation are always performed. Group I substances were responsible for 92% of deaths of known addicts, and morphine was found in 55% of the cases. In contrast to the other countries, methadone was also a common finding in drug addicts. This reflects the use of methadone in drug addiction treatment programs, which is very seldom practiced or even illegal in the other Nordic countries. Dextropropoxyphene poisoning was also a distinct finding, in both addicts and non-addicts. Ketobemidone was commonly used and abused in Denmark, and it caused several deaths. This substance is also prescribed in Norway and Sweden, but during the study period no ketobemidone-related deaths were registered in these countries. Barbiturates and group IV drugs did not seem to be important intoxicants in Denmark in this age group, but the medicolegal routines practiced in Denmark do not favor the detection of these drugs.

A rather high proportion of addicts (33%) was also found in the Norwegian material. Owing to the Norwegian police routines, however, the Norwegian data may not reflect all fatal intoxications in non-addicts, whereas the number of addicts is assumed to be quite complete. Morphine was the predominant intoxicant found in Norwegian addicts. The strict prescription regulations in force for dextropropoxyphene since 1982 have decreased its importance as an intoxicant in Norway [15]. Most barbiturates were withdrawn in 1980, leading to a decrease in barbiturate deaths. On the other hand, the number of deaths caused by antidepressants has increased, and antidepressants were commonly detected in the Norwegian material.

In Sweden the incidence of fatal drug intoxications was similar to that in Finland and Norway. However, addicts accounted for 16% of all cases. Morphine

was also commonly found, being detected in 72% of the addicts. The only fatalities caused by group II substances in the present study were found in Sweden: one case of amphetamine and one of ephedrine poisoning. Although in the other countries orphenadrine was not usually detected in fatal poisonings, an exceptionally large number of cases was found in Sweden.

Iceland had the lowest rate of fatal drug intoxications, and not one of the subjects examined was a known addict. Nor were any group I or II drugs detected. Carbon monoxide and ethanol together explained most (83%) of the intoxications. Since 1979 the incidence of carbon monoxide intoxications (suicides) in Iceland has increased, whereas other fatal intoxications have decreased [20].

The materials used in this study were culled from existing forensic toxicological data, and in part the results therefore reflect differences in the legal autopsy routines of the various countries. The drug addict group is assumed to be nearly complete in each country, and the data presented probably give an accurate survey of fatal intoxications in addicts for the period studied. This study is concentrated on intoxications and thus reveals nothing about other causes of death among drug addicts. This can be achieved only in a prospective study carried out in a similar fashion in the different Nordic countries.

References

1. Ghodse AH, Sheehan M, Taylor C, Edwards G (1985) Deaths of drug addicts in the United Kingdom 1967–81. Br Med J 290:425–428
2. Hartnoll RL (1986) Current situation relating to drug abuse assessment in European countries. Bull Narc 38:65–80
3. Ingold FR (1986) Study on deaths related to drug abuse in France and Europe. Bull Narc 38:81–89
4. Nordisk Arbetsgrupp till Kontaktmannaorganet för Narkotikafrågor (1984) Narkotika situasjonen i Norden – en sammanställning og bedömning av tillgängeliga uppgifter. [The narcotics situation in the Nordic countries – a comparison and evaluation of the information available] Nordisk Arbetsgrupp, Stockholm
5. Holmgren P, Lindquist O (1975) Lethal intoxications with centrally stimulating amines in Sweden 1966–1973. Z Rechtsmed 75:265–273
6. Voigt J, Dalgaard JB, Simonsen J (1975) Fatalities among drug users in Denmark in the period 1968–72. Med Sci Law 15:265–269
7. Holmgren P, Lindquist O (1977) Lethal intoxications with morphine in Sweden 1966–1974. Z Rechtsmed 79:149–158
8. Danell N (1980) Deaths associated with hard drugs. Proceeding of the First Scandinavian Conference in Forensic Science, Linköping 11–13.6.1980, pp 47–57
9. Teige B (1980) Deaths related to narcotics in Oslo and surroundings 1977–1979. Proceedings of the first Scandinavian Conference in Forensic Science, Linköping 11–13.6.1980, pp 65–70
10. Alha AR, Parviainen A-R, Tamminen V (1981) Forensic chemical examinations in Finland, 1979 – trends in fatal poisonings. J Forensic Sci 26:758–765
11. Kringsholm B, Voigt J, Daalgaard JB, Simonsen J (1981) Deaths among narcotic addicts in Denmark in 1978 and 1979. Forensic Sci Int 18:19–30
12. Steentoft A, Worm K, Christensen H (1984) Deaths among drug addicts in East Denmark in 1982 and 1983. Proceedings of the 21st Meeting of the International Association of Forensic Toxicologists, Brighton 13–17.9.1984, pp 229–236
13. Kaa E (1987) Deaths from poisoning in Jutland 1981–85. Arch Pharm Chem Sci Ed 15: 50–64

14. Steentoft A, Kaa E, Worm K (1988) Fatal intoxications in Denmark following intake of morphine from opium poppies. Z Rechtsmed 101:197–204
15. Teige B, Kaa E, Bugge A (1988) A comparison of drug-related deaths in Oslo, Norway and Aarhus, Denmark. J Forensic Sci Soc 28:311–319
16. Single Convention on Narcotic Drugs (1961) Schedules I and II, United Nations
17. International Convention on Psychotropic Drugs (1971) schedules I, II, III and IV, United Nations
18. Poikolainen K (1977) Alcohol poisoning mortality in four Nordic countries. A thesis. The Finnish Foundation for Alcohol Studies, Forssa
19. Hauge R, Irgens-Jensen O, Helgason T, Hibell B, Mäkelä K, Nilsson T, Olofsdottir H, Simpura J (1987) Alkoholen i Norden. [Alcohol in the Nordic countries] Hekapaino Oy, Helsinki, pp 15–34
20. University of Iceland (1979–1984) Annual reports of the Department of Pharmacology. University of Iceland, Reykjavík

Received October 20, 1988