

A 20-year longitudinal prospective study of 284 heroin addicts in Stockholm County, Sweden

by

Mützell S.

Abstract

A large number of individuals suffering from heroin intoxication were found unconscious in Stockholm City and taken to the hospital for resuscitation. Apart from the emergency resuscitative measures, great effort was needed on the part of the staff to induce the patients to remain in hospital for treatment after recovering consciousness and most of the time they had to have a direct line to the police to obtain help in detaining the patients. This longitudinal prospective investigation has covered a 20-year period from the initial examination in 1977-79. During the three years 1977-1979, 22 men and 9 women had died after arrival unconscious, from heroin intoxication, at the Department of Internal Medicine at Serafimer Hospital and the remaining 200 male and 84 female probands were then followed. As expected, we found that the heroin addicts had developed social adjustment problems, including criminality and abuse of alcohol and drugs, and they had a frighteningly high mortality of about 67-73% during these 20 years.

Key-words

Longitudinal prospective study, heroin addicts, social adjustment problems.

Introduction

The aim of this study was to examine social characteristics and number of deaths and to analyse the overall and cause-specific mortality of 284 heroin addicts from Stockholm County during a 20-year longitudinal prospective study compared to controls also from Stockholm county.

In March 1977 Swedish Television (STV) could for the first time show heroin addicts taken care of at a hospital in Sweden, Serafimer Hospital in Stockholm, when I went on STV to warn about the risks of an overdose or an allergic shock when using heroin. The number of drug addicts every year that suffer fatal poisoning has increased from 74 in 1980 to 194 in 1996 in Sweden. Stimson and Oppenheimer (1), in a detailed account of 101 heroin addicts followed for ten years, report a 15% mortality. Kringsholm (2) investigated a total of 1,618 fatalities among drug addicts during the period 1968-1986 and the annual number rose from 5 in 1968 to 163 in 1980; thereafter there has been a gradual fall to 121 in 1986. Gronbladh et al. (3) studied the mortality in a cohort of 115 street heroin addicts for 5-8 years and found the mortality rate to be 63 times that expected. Rutenber et al. (4) found significant negative correlations between concentrations of ethanol and morphine in blood. Caplehorn et al. (5) performed a long-term follow-up of a cohort of 307 heroin addicts and they found that subjects were nearly three times as likely to die outside methadone maintenance as in it (95% CI RR 1.45 to 5.61). Perucci et al. (6) examined a total of 3,411 men and 789 women who were enrolled in methadone treatment centres between 1980 and 1988. The overall standard mortality ratio (SMR) was 10.10 in the entire cohort. Goldstein and Herrare (7) followed 1,019 heroin addicts during a 22-year period and found a SMR of 4.0 for males and 6.8 for females. Oppenheimer et al. (8) and Tobutt et al. (9) studied a cohort of 128 heroin addicts from London. The mean mortality rate was 1.84% annually, and the excess mortality ratio was 11.9. Davoli et al. (10) analysed the overall and cause-specific mortality among 4,200 intravenous drug users in Rome during the years 1980-1988 and they were followed up until 1992. The age-adjusted mortality rate from all causes increased from 7.8 per 1,000 person-years in 1985/86 to 27.7 per 1,000 in 1991/92. Frischer et al. (11) studied drug injectors' mortality and survival in Glasgow during the years 1982-1994. The average annual mortality rate of 1.8% was the same as that observed in a London cohort follow-up from 1969 to 1991. The excess mortality ratio of 22.0 was almost double the London rate (11.9) because of the much lower age of mortality (26.3 vs. 38.2 years).

Subjects and methods

Study population

During the years 1977-1979 the Department of Internal Medicine at Serafimer Hospital in Stockholm, Sweden, treated a cohort of street heroin addicts suffering from heroin intoxication who were found unconscious by a friend or a policeman in the very heart of the City of Stockholm. Factors contributing to death in some cases included lack of opiate tolerance as well as the conjoint abuse of ethanol. Free morphine was identified more often in the blood of victims dying rapidly than in the blood of those with longer post-injection survival. The reason why they were unconscious differed but in most of them was an overdose, an allergic reaction to the heroin itself and, in a few of them, the fact that they had recently been released from prison or custody and started to take the same high dose of heroin as they had taken before they were arrested.

As a physician at the hospital, I followed the street heroin addicts during the years 1977-79 and studied 315 patients (the probands). They comprised 222 men with a mean age of 25 ± 9 years and 93 women with a mean age of 23 ± 5 years, consecutively admitted to Serafimer Hospital in Stockholm. The ambulance journey took about 10-15 minutes from the city centre and 22 men and 9 women of the probands died. Causes of death are coded according to the Swedish version of the International Classification of Diseases (12).

Apart from the emergency resuscitative measures, great effort is needed on the part of the staff to induce the patients to remain in hospital for treatment after recovering consciousness (13). The cases of intoxication are treated with respiratory support and repeated injections of the specific opiate antidote, naloxone¹. Withdrawal symptoms are treated by substitution with long-acting opiate analogues having cross tolerance to morphine/heroin, e.g. dextropropoxyphene or methadone (14). Twenty-two men and 9 women died after arrival at the Department of Internal Medicine, but we followed the surviving 284 heroin addicts for 20 years from 1977-79 until 1996. They were aged 16-46 years. The remaining probands were 200 male patients with a mean age of 25 ± 8 years and

¹ 1 ml injection fluid 0.4 mg/ml contains: Naloxone.hydrochloride. 0.4 mg, sodium chloride. 9.0 mg, hydrochloric acid.q.s., water for injection to 1 ml.

84 female patients with a mean age of 23 ± 8 years. At the conclusion of the follow-up period, the age range of the cases was between 36 and 64 years. The longitudinal prospective investigation has covered a 20-year period from the initial examination in 1977-1979. The mean deviation and standard deviation of the follow-up period was 19 ± 8 years and the mean age at the end of the study was 41 ± 6 years for the male probands and 40 ± 6 years for the female probands.

The controls

The controls were recruited at the same time as the probands from Stockholm County, which means during the year 1977, and drawn from the National Census Register covering all Swedish inhabitants. The matched general population controls were stratified with regard to age and a sample of 200 each of men and women was drawn, with 99 persons in the age-group 16-30 years, 66 persons in the age-group 31-40 and 35 persons in the age-group 41-50 years (table 1).

TABLE 1
Surviving probands and controls. Total numbers by age-groups and sex

Age intervals in years at the beginning of the study	Male controls (n=200)	Male probands (n=200)	Female controls (n=200)	Female probands (n=84)
16-30	99	167	99	78
31-40	66	29	66	37
41-50	35	4	35	3

We used toxicological analyses and other autopsy data to examine the mechanisms by which the risk of death was increased by injected street preparations of heroin. Since that time, no personal contact has taken place between the investigator and the individuals comprising the probands. All the following interview data were obtained using the social welfare officers and the blind method and were complete before compilations were begun. The various registers scrutinised for reports were: the registers of the parish offices, social welfare committees, child welfare committees, the Temperance Board, the Social Insurance Office, the Information System of the Medical Services Board of Stockholm County Council, the Maria Outpatient Clinic, the Swedish Road Safety Office and the Criminal Offenders Register. The material covered by the descriptions of life situations and health status during the 20-year follow-up period comprised the probands and controls, who all could be traced through the entire period without gaps.

Statistics

Data were analysed by the Chi-square test. Means were compared by t-tests for the samples, as appropriate, and we took $p < 0.05$ to indicate statistical significance. In table 3 we also present the relative risks or odds ratios for each group.

Results

Fifty-one addicts were transferred to psychiatric acute wards and clinics after repeated injections of naloxone, 11 stayed in admission wards, 14 were taken in for intensive care, 38 were taken care of by the police, 122 absconded and 48 returned to the Central Railway Station after a struggle with the staff at the emergency department.

Social records

Social characteristics of the two groups of surviving drug addicts and their controls are presented in table 2. There was a slight difference in age between the groups. Sixty-six per cent in both groups of probands were registered by the Temperance Board, but only 12% of the male controls and 6% of the female controls. According to the Criminal Offenders Register, 65% of the males and 52% of the females had committed various crimes.

Significantly more probands were registered in the Children's Welfare Committee Register during childhood and there were more foster home placements and more broken homes in this group. During their childhood, the probands had had significantly more treatment at children's psychiatric wards and counselling clinics. The most common reason for establishing contact with children's psychiatric outpatient clinics or counselling clinics was antisocial behaviour and school adjustment problems.

All of the probands had abused alcohol and/or drugs and the individuals applying for psychiatric care for problems of abuse were stated to have abused both alcohol and various narcotics. Drug abuse usually meant abuse of heroin and amphetamines, usually administered intravenously. Significantly more probands than controls had had treatment at surgical and psychiatric wards and clinics, and hospital treatment for physical illness and injury.

TABLE 2
Social characteristics of the probands compared to the controls. Percentages

	Male controls (n=200)	Male probands (n=200)	Female controls (n=200)	Female probands (n=84)
Age (years)	27 ± 9	25 ± 8	27 ± 9	23 ± 8
Registration by Temperance Board	12	66***	6	66***
Convicted of crimes	8	65***	4	52***
Registration in Children's Welfare Committee Register during childhood	4	20***	8	30***
Foster home placement	0	10***	0	20***
Broken homes	8	15*	10	15
Inpatient or outpatient treatment periods and visits to somatic clinics	21	60***	30	75***
Surgical wards and clinics	42	85***	50	75***
Hospital treatment for underlying physical illness or injury	10	30***	18	35**
Psychiatric wards and clinics and children's psychiatric wards and counselling clinics	6	25***	12	40***
Used narcotic drugs (morphine, amphetamine, heroin etc.)	7	100***	4	100***
Regular or periodic consumption of hypnotics/sedatives	24	80***	20	80***

Level of significance for male and female controls vs. male and female probands by Student's t-test and X^2 test: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

Number of deaths among the probands and controls

The relative risk (RR) of dying in the age interval 16-30 years is 9 for male and 8 for female probands. The RR for death in the age interval 31-40 years is 10 and 15 among the male and female probands respectively. The RR for death in the age interval 60+ is 2 for the male probands and there were no female probands in this age-group (table 3).

During the same 20-year period, the mortality was significantly lower for the female controls (14%) compared to the male controls (19%) and the probands had a significantly higher death rate, 73% for the males and 67% for the females. Eleven per cent of the men and 13% of the women were stable and abstinent from all drugs and living ordinary lives, 9% of the men and 11% of the women continued using opiates or receiving prescribed opiates but otherwise lived ordinary lives and 7% of the men and 9% of the women were either off drugs or still attending clinics but having no major problems. Thus, among the survivors of the probands no-one really still had major problems.

TABLE 3

Number of deaths and relative risk of death for probands and controls of the same age and sex categories in age intervals. Total numbers

Age intervals in years at the end of the study	Male controls (n=200)	Male probands (n=200)	Female controls (n=200)	Female probands (n=84)
16-30	4/39	60/65	3/34	20/28
RR		9		3
95% CI		4-23		3-24
31-40	4/41	35/36	3/60	18/24
RR		10		15
95% CI		4-25		5-46
41-50	5/56	25/40	3/32	12/26
RR		7		5
95% CI		3-17		2-15
51-60	7/29	17/50	3/39	6/6
RR		1		13
95% CI		1-3		4-39
60+	17/35	9/9	15/35	0/0
RR		2		
95% CI		1-3		
Total numbers	37/200	146/200	27/200	56/84

RR = relative risk; CI = confidence interval.

Because of the low numbers in table 3, the exact limits used for the CI have been adjusted.

Of those who died, 82% and 89% of the male and female probands respectively and 35% and 33% of the male and female controls respectively had died between 16 and 50 years of age.

The distribution of the 202 probands' and the 64 controls' deaths in the present material according to sex is given in table 4. The probands had a significantly higher death rate due to acute alcohol intoxication, alone or combined with drugs, pneumonia, external assaults, struggles, fractures, traffic accidents and jumping from high buildings and they had more often succeeded in committing suicide. Significantly more male probands died of cirrhosis of the liver and four men and two women were stabbed to death among the probands but no-one in the control groups. Fire caused by smoking in bed led to one death each among the male probands and controls, and one female proband and two male and female probands who were HIV positive died of fulminant AIDS.

There are certain causes of death that are far more common among the probands than in the general population; among them is suicide. In

TABLE 4
 Number of deaths during a period of 20 years and analysis of the overall and cause-specific mortality. Total numbers

	Male controls (n=200)	Male probands (n=200)	Female controls (n=200)	Female probands (n=84)
Mortality during a period of 20 years (%)	19	73***	14	67***
Mortality causes with ICD-10 codes in parentheses				
Septicaemia (A40)	0	2	0	2*
Aids (B24)	0	2	0	2*
Cancer of the lungs, salivary glands, oesophagus, stomach, prostate, brain and other forms of cancer (C08, C15-16, C22, C39, C61, C71)	4	7	3	3
Myocardial infarction (I21)	16	9	12	3
Cerebral haemorrhage and subarachnoidal bleeding (I60-61)	4	8	3	4*
Cerebral infarction (I63)	3	2	3	0
Pneumonia (J12-15)	5	14**	3	4*
Perforated gastric ulcer (K25-27)	3	5	2	2
Cirrhosis of the liver with hepatic coma (K70)	0	4*	0	1
Suicide (R99; X64)	0	21***	0	3**
Fire due to smoking in bed (T29)	1	1	0	1
Acute alcoholism with intoxication (T51; Y91)	1	16***	1	2
Death through external assault, struggles, fractures, traffic accidents and jumping from high buildings (T08-14; V49; V88-89; W13; Y30-31)	0	27***	0	15***
Alcohol intoxication combined with hypnotics and sedatives and suffocation by vomiting (T43; W84)	0	24***	0	12***
Homicide (Y09)	0	4*	0	2*
Total number of deaths	37	146	27	56

Level of significance for male and female controls vs male and female probands by χ^2 test: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$.

this study, the rate of violent deaths was 1% in both the male and female control groups, 47% in the male proband group and 42% in the female proband group.

Discussion

The mortality in the general population from this region of Greater Stockholm differed enormously from the mortality of the heroin addicts,

as was expected (15, 16). Like Zimney and Luke (17), we found that factors contributing to death in several cases included lack of opiate tolerance and the conjoint abuse of ethanol. Free morphine was identified more often in the blood of victims dying rapidly than in the blood of those with longer post-injection survival. A statistically significant correlation between the number of heroin-related fatalities and the purity of heroin available to the user was observed. The overwhelming majority had had heroin overdoses but heroin users are reluctant to seek medical attention. An ambulance was called on only half of the overdose occasions and when they came to Serafimer Hospital it was because they could not struggle against the ambulance personnel since they were unconscious when the journey to hospital started. The reason why they were unconscious differed but in most of them was an overdose, an allergic reaction to the heroin itself and in a few of them the fact that they had recently been released from prison or custody and started to take the same high dose of heroin as they had taken before they were arrested. Among those of our patients who had been admitted to the drug addiction department for detoxification, either under compulsion or of their own free will, there was no significant difference between those detoxified under compulsion and patients submitting voluntarily, but we must say that we think that compulsory detoxification should be applied more often than is the case at present, to save the patients' lives. What was most frustrating to the staff was that, apart from the emergency resuscitative measures, great effort was needed to induce the patients to remain in hospital for treatment after recovering consciousness and most of the time we had to have a direct line to the police to obtain help in detaining the patients.

References

1. STIMSON G V, OPPENHEIMER E. Heroin Addiction: Treatment and control in Britain. London and New York: Tavistock, 1982.
2. KRINGSHOLM B. Deaths among drug addicts in Denmark in 1968-1986. *Forensic Sci Int* 1988; 38: 139-149.
3. GRONBLADH L, OHLUND L S, GUNNE L M. Mortality in heroin addiction: impact of methadon treatment. *Acta Psychiatr Scand* 1990; 82: 223-227.
4. RUTTENBER A J, KALTER H D, SANTINGA P. The role of ethanol abuse in the etiology of heroin-related death. *J Forensic Sci* 1990; 35: 891-900.
5. CAPLEHORN J R, DALTON M S, CLUFF M C, PETRENAS A M. Retention in methadone maintenance and heroin addicts' risk of death. *Addiction* 1994; 89: 203-209.
6. PERUCCI, DAVOLI M, RAPITI E, ABENI D D, FORASTIERE F. Mortality of intravenous drug users in Rome: a cohort study. *Am J Public Health* 1991; 81: 1247-1249.
7. GOLDSTEIN A, HERRARE J. Heroin addicts and methadone treatment in Albuquerque: a 22-year follow-up. *Drug Alcohol Depend* 1995; 40: 139-150.

8. OPPENHEIMER E, TOBUTT C, TAYLOR C, ANDREW T. Death and survival in a cohort of heroin addicts from London clinics: a 22-year follow-up study. *Addiction* 1994; 89: 1299-1308.
9. TOBUTT C, OPPENHEIMER E, LARANJEIRA R. Health of cohort of heroin addicts from London clinics: 22 year follow-up. *BMJ* 1996; 312: 1458-1465.
10. DAVOLI M, PERUCCI C A, FORASTIERE F, DOYLE P, RAPITI E, ZACCARELLI M, ABENI D D. Risk factors for overdose mortality: a case-control study within a cohort of intravenous drug users. *Int J Epidemiol* 1993; 22: 273-277.
11. FRISCHER M, GOLDBERG D, RAHMAN M, BERNEY L. Mortality and survival among a cohort of drug injectors in Glasgow, 1982-1994. *Addiction* 1997; 92: 419-427.
12. The Swedish version of the International Classification of Diseases (ICD-10), Tenth Revision, The World Health Organization, Geneva (1992).
13. MÜTZELL S. Emergency care of cases of heroin intoxication -experiences at Serafimer Hospital. *Lakartidningen* 1977; 74: 4326-4327.
14. ANGGARD E. Morphine intoxication and withdrawal. *Lakartidningen* 1977; 74: 4305-4309.
15. MÜTZELL S. Alcohol consumption in a population sample of urban men -with neuropsychological assessment and computed tomography of the brain. Department of Family Medicine, Uppsala University, Uppsala. Thesis, 1988.
16. MÜTZELL S. Life with an alcoholic father. A contribution to the understanding of possible early development of alcoholism. Department of Education, Stockholm University, Stockholm. Thesis, 1994.
17. ZIMNEY E L, LUKE J L. Narcotic-related deaths in the District of Columbia: 1971-1979. *J Forensic Sci* 1981; 26: 462-469.