

## HEROIN-RELATED DEATHS IN VICTORIA (AUSTRALIA): A REVIEW OF CASES FOR 1997 AND 1998

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**ABSTRACT:** The number of deaths attributed to the intravenous use of heroin has increased dramatically in Victoria in the past five years. Since 1991, the prevalence of deaths attributed to heroin toxicity has risen from 49 to 268 in 1998. This represents a five-fold increase in seven years. The increase has been particularly dramatic over the last 12-months (an increase in over 60%). In 1998 deaths from intravenous use of heroin each year constituted 47% of all drug deaths reported to the coroner (Annual Report, 1997/98, Victorian Institute of Forensic Medicine). The heroin death is typified by a median age of 30 years (both male and female), although the age range extends from children as young as 15 to adults in their fifth decade of life. Over 85% of cases are using other central nervous system depressants, with benzodiazepines (45%) and alcohol (36%) being the most common. Approximately 60% of deaths occur indoors at a private residence, the remaining deaths occur in public places and other locations. A similar number (60%) die alone. Disturbingly, the heroin problem is not restricted to the known "hot-spots" in Melbourne; rather most suburban areas appear to be affected. The mean ( $\pm$  SD) blood concentration of total morphine was  $0.52 \pm 0.53$  mg/l. Concentrations ranged from 0.01–3.4 mg/l. The median concentration was 0.4 mg/l. A summary of the toxicological findings from 434 heroin-related deaths will be presented.

**KEY WORDS:** Heroin; Morphine; Illicit drugs.

*Problems of Forensic Sciences, vol. XLII, 2000, 95–101*

*Received 9 September 1999; accepted 16 May 2000*

### INTRODUCTION

The abuse of the illicit drug heroin has been a social problem for many years. In Australia, opioid abuse is the third most frequently nominated drug problem after tobacco and alcohol. The estimated costs to society not only in terms of loss of life, but socially and economically, are very high. The extent of drug abuse, particularly with heroin, is difficult to determine. It is estimated that 2% of the Australian population use heroin regularly [15]. In Australia, it is estimated that tangible costs (law enforcement, cost of drugs, economic costs of lost production, health care costs and cost of opioid consumption), amount to ~1000 million AUD per annum [14]. In New South Wales (NSW), there have reports describing an increased prevalence of heroin deaths in that State, including evidence of poly-drug use and an increasing morphine concentration over the period

1992 to 1996 [2, 8]. These data have shown an increase in the number of such deaths at almost 70% in 3 years. Increases have also been observed in Western Australia (WA) [13].

There has been no detailed evaluation of heroin-related deaths in Victoria. However, recent months have seen an increased media debate over the rising heroin toll in this State. In this report we present a detailed assessment of all heroin-related deaths in Victoria for the years 1997 to 1998 including demographic data such as age distribution, occupation and location of the deceased. A comparison with the death rate in previous years is also presented.

#### SUBJECTS AND METHODS

The Victorian Institute of Forensic Medicine (VIFM) is a statutory body with responsibility to oversee and provide forensic pathology and related services in Victoria. The Institute conducts some 2500 post-mortem examinations each year at its own facilities where it also performs the toxicological analyses in selected cases, as well as in those examinations performed in Victorian country centres.

Cases were selected based on coronial reports in which deaths were classified as heroin-related from the 1/1/97 to 31/12/98. In the 434 cases included in this report, autopsies were performed by full time pathologists either at the VIFM or at a regional hospital in Victoria. Autopsy included macroscopic and microscopic examination of all the major organs. Police reports were used to obtain information regarding circumstances of death. Other relevant information was obtained from reports made available at the State Coroners office. A heroin-related death was a case in which the use of heroin was considered a substantial direct cause of death. Heroin use was confirmed by either the recent mention of heroin use in the circumstances and/or the presence of 6-monoacetylmorphine (6-MAM) in the urine. In some cases heroin or 6-MAM was detected in physical exhibits located near the body.

All cases were subject to a full toxicological examination [5, 6]. Other drugs were identified, quantified and confirmed using standard toxicological procedures. Serological testing was conducted using commercially available kits in accordance with the manufacturer's instructions.

Mean  $\pm$  standard deviation is shown in the text. Statistical analyses for assessing differences between groups were conducted using Sigma-Stat for Windows V2.0.

## RESULTS

**Frequency of heroin deaths**

The number of heroin deaths in the state of Victoria has climbed steadily since the turn of the decade. Since 1991, the prevalence of deaths attributed to heroin toxicity has risen from 49 to 268 in 1998. The rate in 1998 was 6 per 100,000 population. This represents a five-fold increase over a period of seven years (Figure 1).

Early trends for 1999 disturbingly show that deaths due to heroin use are increasing (168 deaths for the seven months to July). In 1998, deaths from intravenous use of heroin each year constituted 47% of all drug deaths reported to the coroner [1].

**Demographic data**

Of the 434 heroin-related deaths in 1997 and 1998, the average age for males and

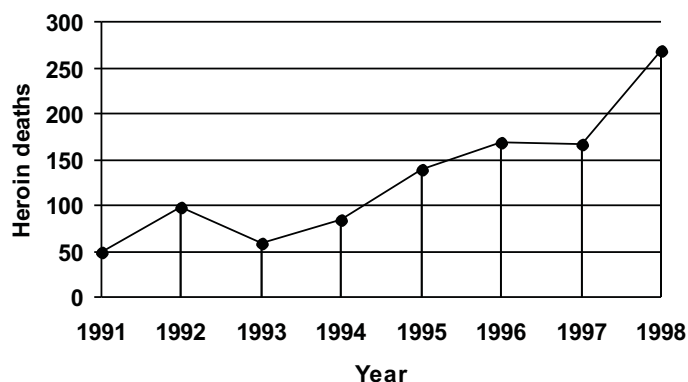


Fig. 1. Number of heroin deaths in Victoria by year.

females were  $30 \pm 8$  and  $29 \pm 8$  years, respectively (range 15–56 years). Eighty-three percent of all heroin deaths were male and 11% were under the age of 21.

Most heroin deaths occurred mainly in the home (60%). The number of deaths which occurred in public places (public toilets, shopping centres, street etc.) accounted for only 13% of all 434 deaths.

The majority of heroin users were unemployed (47%) and the deaths occurred in a large number of suburbs across Melbourne (168 different suburbs). Most deaths occurred on Thursday (18%) with the weekend also showing high numbers of deaths. In 67% of cases, the deceased was found by someone known to the deceased (i.e. friend, relative or partner). There were 256 deceased persons who were discovered alone (59%) while 168 were not alone at the time of death. There were 10 cases where the identity of this person was unknown. In 72% of cases an ambulance was called.

## Serology

The majority of cases (61%) tested positive to antibodies for hepatitis C. Of those that were positive for hepatitis C, males showed a much higher incidence than females, 81% as compared with 19%. There were 2 cases positive for HIV infection and 8 cases for hepatitis B infection.

## TOXICOLOGICAL FINDINGS

The mean blood concentration of total morphine in the 1997 and 1998 cases was  $0.52 \pm 0.53$  mg/l. Concentrations ranged from 0.01–3.4 mg/l. The median concentration was 0.4 mg/l.

The concentration of total morphine has not altered over the course of this decade. In 1990, the mean concentration was  $0.51 \pm 0.37$  mg/l (n = 64), and in 1998 the mean concentration was  $0.51 \pm 0.42$  mg/l (n = 144).

The number of cases with no detectable morphine in urine, or very low concentrations (<1 mg/l) represented 16% of the cases.

TABLE I. PREVALENCE OF DRUGS IN 434 HEROIN-RELATED DEATHS IN VICTORIA (1997–1998)

Prevalence of other drugs	1997 [%]	1998 [%]	Overall [%]
Morphine only	9	16	14
Morphine plus benzodiazepines	53	40	44
Morphine plus alcohol	29	40	36
Morphine plus cannabinoids	38	28	32
Morphine plus miscellaneous drugs	17	14	15
Morphine plus amphetamines	7	10	9
Morphine plus other opioid drugs	8	11	10
Morphine plus other psychoactive drugs	9	10	10

In the 1997 and 1998 cases, benzodiazepines were detected in 44% of all cases. The most frequently detected benzodiazepines were diazepam, temazepam and oxazepam. Alcohol was detected in 37% of all cases. The average blood alcohol concentration (BAC) was  $0.12 \pm 0.08$  g/100 ml. Drugs in addition to morphine were detected in 86% of cases. The prevalence of drugs is shown in Table I. The prevalence of drugs other than morphine was no different to those observed in the years 1990 to 1996.

## DISCUSSION

The number of heroin deaths in Victoria gives cause for concern. Since 1991 the number of fatalities associated with heroin use have increased 5-fold in Victoria. The reasons for the dramatic increase in death are not clear, however significant increases have also occurred in NSW [2, 8], WA [13] as well as other parts of the world [4].

Other drugs were found in 86% of heroin-related deaths. This is an important finding since alcohol and possibly other CNS depressants increase the toxicity to heroin [3, 11, 12]. The complications of poly-drug use, particularly CNS depressants have been well documented in previous reports of heroin fatalities [8]. The frequent detection of benzodiazepines supports the notion that the consumption of benzodiazepines is an associated risk factor for heroin deaths [9]. The high frequency of benzodiazepines also suggests that heroin-users are regularly using these drugs to minimise withdrawal symptoms. Since the contribution of other drugs to death in heroin users in Victoria has remained relatively constant over the last 10 years, this does not explain the increased death rate. However, it is not clear at this stage if larger amounts of these drugs are taken now compared to previous years.

It is of interest that 16% of deaths showed little or no morphine in urine. This result strongly suggests death has occurred shortly after injection, since no significant amounts of morphine have been excreted, and the deceased had not used heroin within approximately two days of the fatal dose. Occasional users of heroin are unlikely to develop tolerance, hence are most at risk of a fatal overdose. This becomes an increasing risk factor with rising purities of street heroin.

It has been suggested that anaphylactoid shock could be responsible for death in heroin users that have died rapidly after injection [7]. There was no pathological evidence that such reactions occurred in these cases.

The average age of the cases compares similarly with other studies both locally [3, 15] and overseas [16]. The number of people dying from in their 30's is similar to the number dying in their 20's ( $n = 187$  vs  $n = 162$ ). This contradicts recent Australian National Drug Strategy figures that show very few people in the 30–39 age group having used heroin, although the figures are likely to be underestimated due to the nature of the surveys [14]. It is noteworthy that the spread of ages in this study includes persons in their sixth decade of life, as well as those as young as fifteen.

In summary these data show a disturbingly large increase in heroin-related deaths during this decade in Victoria. The characteristics of these cases confirm a high percentage of unemployment and a large use of other drugs in addition to heroin. Most areas of Melbourne and many regional areas are now affected by this problem. A significant percentage of cases have died very quickly in the circumstance of no recent prior use of heroin suggesting lack of tolerance for the dose injected. The mean blood concentration of total morphine has remained constant during this decade suggesting the purity of street heroin is unlikely to be the major reason for the increase in heroin deaths in recent years.

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