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Self-poisoning in Adolescents
Hospital Admissions and Deaths in the Oxford Region 1980–85

C. SELLAR, K. HAWTON and M. J. GOLDACRE

Linked hospital and death records for 10–20-year-olds admitted with a diagnosis of poisoning were analysed. Between 1980 and 1985 there was a significant decline in admission rates, which was mainly attributable to a decline among 16–20-year-old females. There was no evidence of a decline in the admission rates among 12–15-year-olds. Ten per cent of the study population had at least one further hospital admission for poisoning during the mean follow-up period of 3.6 years. Female admission rates were substantially higher than those in males but readmission rates, given a first admission, were similar. The death rate in the study cohort was significantly higher than would be expected in the general population of this age and nearly all the deaths were from violent or unnatural causes.

Self-poisoning is one of the commonest reasons for hospital admission in adolescents. Previous studies of people aged 12–20 years in the Oxford region (Hawton & Goldacre, 1982; Goldacre & Hawton, 1985) indicated that admission rates for self-poisoning increased during the 1970s, as they did nationally, and showed that the average annual death rate in the few years after discharge from hospital after an episode of self-poisoning was approximately four times higher than the national average annual death rate in the same age group. Suicide was the main reason for death in self-poisoners.

This paper reports the findings of a study undertaken in the Oxford region to provide updated information about trends in admission rates for self-poisoning in adolescents. The aims of the study were to determine whether the general decline in admission rates seen since the late 1970s (Brewer & Farmer, 1985) has been experienced by adolescents, to study whether the age at which self-poisoning becomes common has changed, and to use record linkage to examine the contemporary profile of repetition rates and mortality rates among self-poisoners.

Method

Oxford Record Linkage Study

The Oxford Record Linkage Study (Goldacre *et al*, 1988) was used to analyse data on hospital admissions for self-poisoning in people aged 12–20 years. The study contains abstracts of records of hospital admissions and death. As these records can be linked, it was possible to study the pattern of repeat episodes and subsequent death for individuals following an initial admission.

In the period covered by this report, data were collected in six districts of the Oxford region with a total population of two million people, including approximately 390 000 people aged 10–20 years.

Identification of episodes of poisoning

Episodes of poisoning were identified using ICD-9 codes for "poisoning by drugs and medicaments" (codes 960–977). These categories include deliberate self-poisoning and overdoses of substances taken in error, but "exclude the adverse effects of correct substances properly administered" (World Health Organization, 1978). Although episodes other than deliberate self-poisoning are therefore covered by these codes, hospital admissions in these categories for reasons other than deliberate self-poisoning are in fact very uncommon in teenagers. We were able to verify this in a sample of patients, as in our previous study (Hawton & Goldacre, 1982). Of 1123 records for poisoning in our sample, 1065 (95%) were confirmed as deliberate self-poisoning. Routine data on hospital admissions for poisoning coded in ICD-9 categories 960–977 therefore represent a good proxy for large-scale investigations of self-poisoning in this age group.

Data were analysed for general hospital admissions of individuals aged 10–20 years who had a main discharge diagnosis of poisoning between 1980 and 1985. Counts of admissions from 1974 to 1979 were also recorded, for comparison. Most of the results reported here are confined to the 12–20 year age group because, as we report below, poisoning was very uncommon in 10- and 11-year-olds. Trends in admission rates were analysed using the χ^2 test for trend in proportions (Armitage & Berry, 1987).

Repetition and deaths

Each patient's first recorded episode of poisoning in 1980–84 was defined as an index admission. Any subsequent admissions for poisoning, and any deaths, up to the end of 1985 were identified by record linkage. Each person was followed by this means for a minimum of one and a maximum of six years (mean 3.6 years). Any hospital admissions outside the Oxford Record Linkage Study area are not recorded in the system. However, deaths of people resident within the area but which occur outside it are recorded. Any further episodes of poisoning and deaths which occurred in those who became

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over 20 years of age during 1980–85 were included in the analysis.

The number of deaths in the study cohort was compared with the number of expected deaths in a population of this age and size. The expected number of deaths was calculated by applying death rates in this age group in the Oxford region for the years of the study to the number of people in each age group in our cohort.

Deaths from poisoning without prior record of hospital admission

All deaths from poisoning, whether as the underlying or a contributing cause, among people aged 12–20 years between 1980 and 1985 in the study region were recorded. These included individuals who died without prior recorded hospital admission for self-poisoning. Any other hospital records on the Oxford Record Linkage Study files for these patients were also identified.

Results

Admission rates by age group, sex, and year

There were 4007 admissions to hospital for poisoning between 1980 and 1985 in the 10–20-year age group. This comprised 3.4% of all admissions to general hospitals in this age group during the period. Only 36 of these episodes were for people aged 10 or 11 years. Between 1980 and 1985 the hospital admission rates for poisoning in 12–20-year-olds showed a small but statistically significant decline (Table I). The major component of the decline was that in admission rates in 16–20-year-old females.

Figure 1 shows that the decline in admission rates in the older adolescents began in 1978, after a peak in 1977. In the younger age group the rates remained more stable, although the trend in the most recent years was, if anything, upwards.

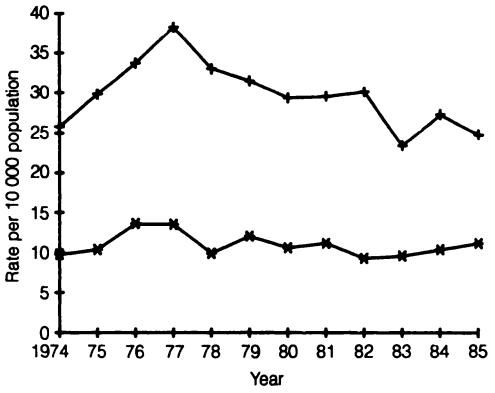


FIG. 1. Hospital admission rates 1974–85 by age group (**12–15 years, + + 16–20 years) for poisoning by drug and medicaments.

Figure 2 shows admission rates at each single year of age and compares data for 1980–85 with that previously reported for 1974–79 (Hawton & Goldacre, 1982). The figure shows that admission rates increase strikingly with age from 12 years. There was no change in the age at which self-poisoning rates increased in the later period; nor was there any evidence of changes in the age profile for either sex between the two study periods. Admission rates for girls were four times higher than for boys in the 12–15-year age group and were more than double those for boys in the 16–20-year age group.

Medicinal agents

The group of agents coded under ICD-9 code 965 (analgesics, antipyretics, antirheumatics) accounted for 50% of all episodes between 1980 and 1985, with drugs acting

TABLE I

Hospital admission rates by age group and sex for poisoning by drugs and medicaments

Age group			*Rate per 10 000 age/sex group*						
		(n)[1]	*1980*	*1981*	*1982*	*1983*	*1984*	*1985*	*χ^2 trend*[2]
12–20 years	All events	662	21.1	21.6	21.3	17.7	20.3	19.3	6.5*
12–15 years	Males	27	4.6	4.0	3.2	3.2	3.0	4.3	0.7
	Females	115	16.9	18.7	15.6	16.2	18.2	18.6	0.3
	All	141	10.5	11.1	9.2	9.5	10.3	11.1	0.0
16–20 years	Males	163	18.1	16.5	17.4	13.3	16.9	14.9	3.0
	Females	358	42.0	44.0	44.2	34.7	39.0	36.0	9.5**
	All	521	29.3	29.5	30.1	23.4	27.3	24.8	12.7**
Drugs acting on central nervous system only[3]									
12–15 years	Males	9	1.6	1.5	1.0	1.0	1.1	1.0	1.4
	Females	25	5.0	3.7	2.7	3.2	4.3	3.5	0.7
16–20 years	Males	42	4.9	4.4	4.8	3.7	3.8	3.1	4.8*
	Females	93	12.0	12.9	12.0	8.5	8.1	8.8	14.4**

1. Average annual number of admissions (for individuals admitted more than once, each admission is counted in this table).
2. χ^2 for trend over 1980–85 in each age/sex group.
3. ICD-9 codes 966–970, principally psychotropics (code 969).
*$P<0.05$, **$P<0.01$.

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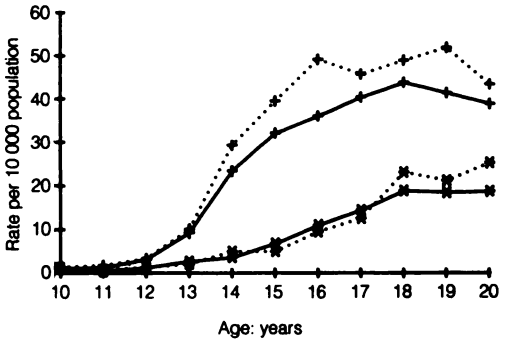


FIG. 2. Average annual rate of hospital admissions 1974–79 (····) and 1980–85 (——) for poisoning by drugs and medicaments by age and sex (+ – + females, ×–× males).

on the central nervous system (codes 966–970), principally psychotropics (code 969), comprising 25% of episodes (Table I). The principal change over time was that there was an overall decline in the number of admissions ascribed to poisoning with psychotropic agents. There was no appreciable change in the use of analgesics or other drugs.

Repetition

Of the 3034 individuals aged 12–20 years who had an index admission between 1980 and 1984, 2152 (71%) were female. Two of the index admissions for boys resulted in their deaths. These two index admissions were excluded from the analysis of repetition rates.

Two hundred and one people (6.6%) had at least one further hospital admission for poisoning within a year after their index admission (Table II). Repetition rates were slightly higher overall in females than males (10.5% and 9.3%, respectively). However, males who had a further admission within one year of their index admission were more likely to be admitted within the first three months (57.4%) than were females (42.9%). Repetition rates were slightly higher in 16–20-year-olds than 12–15-year-olds among those who had a further admission within one year of their index admission (6.9% in older adolescents, 5.8% in younger adolescents). None of these differences were statistically significant. In all, 309 individuals (10.2%) were admitted again for poisoning at least once in the mean follow-up of 3.6 years. The decrease in the proportion of individuals who had a further admission for poisoning within one year of index admission was not significant, and the pattern of repetition was very similar to that reported for the 1970s (Goldacre & Hawton, 1985).

Among those who were 12–15 years old at index admission, none of the boys had more than two admissions for poisoning, but 12 (2.2%) of the girls had three or more admissions for poisoning. Of the 2374 16–20-year-olds, 76 (3.2%) had at least three admissions for poisoning during the study period. The highest number of admissions for poisoning was 14, by a female who was 15 years old at her index admission in 1983.

Deaths following prior admission for self poisoning

Sixteen people in the self-poisoning cohort died. Two males died at index admission and 14 (9 males, 5 females) died during the follow-up. Of these 14, 13 were between 16 and 20 years of age at their index admission and all but one were aged 19 years or over at the time of death. Seven of the 14 deaths occurred within a year of an admission. Only two of those who died had more than one recorded hospital admission for self-poisoning.

The two individuals who died at index admission had coroners' verdicts of suicide. Three of the other 14 also had verdicts of suicide on their death certificates (one male who died from a gunshot wound, another male who died from self-poisoning, and a girl who jumped from a building).

Two of the other 11 deaths were from natural causes, both respiratory deaths in females, and there was no inquest. The remaining nine, seven males and two females, died 'violent' or unnatural deaths (e.g. hanging, drowning, multiple injuries on a railway line, road traffic accidents) but had verdicts recorded other than suicide.

The average annual death rates of those discharged alive after an admission for self-poisoning were 0.6 and 2.8 per 1000 females and males, respectively. The rate for males is significantly higher than the corresponding rate, of 0.8 per 1000 males, in the general population of similar age (Table III).

TABLE II

Number and cumulative percentage of individuals who had at least one further admission for poisoning by length of time to second admission and year of index admission

Year	*No. of index admissions*	*Number of months to first repeat (cumulative %)*				
		0–11	*12–23*	*24–35*	*36–47*	*48 or more*
1980	640	52 (8.1)	21 (11.4)	13 (13.4)	7 (14.5)	7 (15.6)
1981	634	44 (6.9)	11 (8.7)	5 (9.5)	3 (9.9)	0 (9.9)
1982	634	36 (5.7)	7 (6.8)	8 (8.0)	1 (8.2)	–
1983	521	36 (6.9)	11 (9.0)	4 (9.8)	–	–
1984	603	33 (5.5)	10 (7.1)	–	–	–
Total	3032	201 (6.6)[1]	60 (8.6)	30 (9.6)	11 (10.0)	7 (10.2)[2]

1. χ^2 trend = 3.0, not significant.
2. Mean follow-up period of 3.6 years.

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TABLE III

Number of deaths during follow-up in the study population compared with the expected number of deaths for the same age group in the general population

	Observed	Expected[1]	χ^2	Observed/ expected	95% confidence interval[2]
Persons	14	4.8	17.6*	2.9	1.4–4.4
Males	9	2.5	16.9*	3.6	1.2–6.0
Females	5	2.3	3.2	2.2	0.3–4.1

1. Based on deaths for all causes in the Oxford Regional Health Authority area.
2. Estimated using $\sqrt{O}/E$.
*$P<0.01$.

Death from poisoning without prior admission for poisoning

In the same period, 1980–85, ten other people resident in the study region aged 12–20 years died from poisoning by medicinal agents. There was no record of hospital admission for poisoning before their death. Using accepted criteria for obtaining an accurate estimate of the number of suicides by including cases with coroners' verdicts of open verdict and accidental death due to poisoning (Adelstein & Mardon, 1975), it is likely that nine of these deaths were suicides.

Discussion

This study has only covered self-poisoning that resulted in hospital admission or death. It is conceivable that the overall pattern of self-poisoning, including non-fatal cases not admitted to hospital, is different from that reported here. For example, there could have been differences in the characteristics of self-poisoners who were admitted to hospital and those who were not (Owens & Jones, 1988) or changes over time in the proportion of patients presenting at accident and emergency departments who were admitted to hospital (Gardner, 1980). However, at the John Radcliffe Hospital in Oxford there has been no appreciable change over the years covered by this study in this proportion (approximately 88%). If this applies across the region, it indicates that the decline in admissions for self-poisoning in older female adolescents has arisen as a result of a reduction in self-poisoning.

The first recorded admission for poisoning in our data may not have been an individual's first-ever admission for poisoning. A previous admission may have occurred outside the Oxford Record Linkage Study area, in an earlier year, or at a younger age, although the latter is unusual. We also could not identify migration of patients into or out of the Oxford region on an individual basis. Using data from the Office of Population Censuses and Surveys (1986) on movements between family practitioner committees in England and Wales it was possible to estimate that, in aggregate, about 4% of 15–24-year-olds move out of the Oxford region each year. Making an adjustment for this in the older adolescents would indicate that 7.2% of 16–20-year-olds repeat within a year, rather than 6.9%.

Brewer & Farmer (1985) have suggested that the recent reduction in self-poisoning reflects changes in the availability of prescribed sedatives and other psychoactive drugs. In our study the decline in overall admission rates for poisoning has been most strikingly seen in admissions for poisoning using psychotropic-type substances. This could suggest that general practitioners are now more careful in their prescribing of psychotropics (the majority of which will be benzodiazepines).

This result is similar to the result of a study of parasuicide in all age groups admitted to the John Radcliffe Hospital in Oxford (Platt *et al*, 1988), where there was a reduction in the use of barbiturates and minor tranquillisers. In the study by Platt *et al*, there was evidence that this reduction was offset by the increased use of paracetamol. In our study of the Oxford region as a whole we found no increase overall in the use of analgesics or other drugs in the adolescent age group.

In contrast to recent trends in other age groups, admission rates for self-poisoning in young adolescents have not declined. This emphasises the need for general hospital services for self-poisoning patients to maintain close liaison with local child and adolescent services as recommended in guidelines from the Department of Health & Social Security (1984).

Comparing the 1970s and 1980s data there has been no reduction in the age at which self-poisoning becomes common. Repetition rates were similar in this study to those in the earlier study and remain relatively high: 6.6% of individuals had a second admission within a year of their first admission for poisoning.

The risk of death was greater among older adolescents, particularly males. A minority of the deaths had a coroner's verdict of suicide recorded but the violent nature of some of the other deaths suggests that possibly more could have been of suicidal intent. Clinicians need to be especially vigilant for suicide risk in older adolescent and young adult males.

Deaths among male adolescents after admission for poisoning have remained significantly higher than in the general population of the same age group. Nonetheless, most deaths occurred in people with few

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or no previous recorded admissions for self-poisoning. Thus, clinicians should note that, unlike in adults (Hawton & Fagg, 1988), having more than one admission for self-poisoning may not be a good predictor of death. This may be because of effective support and counselling on first admission. It is also possible that there are two populations of self-poisoners: those at high risk of death, and those who have more than one admission for self-poisoning but who are not intent on taking their own lives. Further research is needed to identify the characteristics of self-poisoners who eventually commit suicide, to determine whether ways can be found to reduce this waste of young lives.

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