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Drugs taken in fatal and non-fatal self-poisoning: a study in South London

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This study compared the number and type of substances taken in deliberate self-poisoning with fatal (n=127) and non-fatal (n=521) outcome. The aims were (i) to describe substances typically involved in self-poisoning in England and Wales, (ii) to examine the role of drug 'cocktails' and (iii) to examine whether toxic substances are over-represented in cases with fatal outcome. Over-the-counter (OTC) analgesics, minor tranquillizers and antidepressants accounted for about 70% of substances taken, irrespective of outcome. Compared with survivors, cases who died had taken a higher mean number of substances. Among self-poisonings with a single substance, antidepressants and paracetamol-opiate combinations were over-represented in fatal-outcome cases. This report emphasizes the role of OTC analgesics and antidepressants in overdose-related mortality in England and Wales.

Key words: overdose; suicide; attempted suicide; antidepressant; analgesic

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Introduction

In 1992, almost 50% of all suicides and undetermined deaths in England and Wales were attributable to self-poisoning (1). Although substances involved in fatal self-poisonings are tabulated annually (1), the national information is incomplete, as death certificates do not routinely record all substances detected (2). Non-fatal suicidal behaviour is not registered nationally, so that even less is known about substances involved in non-fatal self-poisoning.

Fatal toxicity index (deaths per million prescriptions) and cohort studies have generated concern about the relative danger associated with tricyclic antidepressants in overdose (3–5). However, such studies rely on information recorded on death certificates, and therefore leave uncertainty about the exact causes of death and the role of other substances taken (6). Similar problems apply to epidemiological research on the relative safety/danger of benzodiazepines (7) and barbiturates (8). Designs based on prescription data are not suitable for investigation of the danger in overdose of 'over-the-counter' (OTC) substances such as paracetamol, now the most frequently used substance in overdose in the UK (9), or drugs of abuse, such as opiates, for which there is a substantial black market and whose role in suicidal behaviour is cause for increasing concern (2).

A Swiss study (10) that compared drugs taken in fatal and non-fatal self-poisoning found few differences between patterns of drugs taken in fatal and non-fatal self-poisoning. This comparison cannot be directly applied to the situation in the UK, given the differing prescribing practices across Europe. Consumption of antidepressants per capita in the UK is higher than in most other countries, whilst the reverse is true for benzodiazepines (11). Given the importance of availability in determining choice of method in suicidal behaviour (12), such differences may be expected to affect patterns of drug usage in self-poisoning.

In the present study, comparisons were made between substances taken in non-fatal and fatal self-intoxications which occurred in South-East London between 1991 and 1994. Toxicology reports, which were available for 95% of the fatal cases, and casualty cards were used to obtain a complete picture of all drugs taken, so that the role of combinations of substances could be examined in more detail than is possible in studies using only death certificates.

Material and methods

Fatal self-poisoning

All cases of unnatural death (n=824) occurring between 1 January 1991 and 31 May 1994 and dealt with by the Inner South London Coroner's Court (catchment area n=900 000) were examined. Cases were classified as suicide if they had received a suicide verdict and/or a suicide note, or other evidence of intent had been recorded and/or the method clearly indicated suicide intent. Only catchment area cases were used. Details of the method and place (hospital or elsewhere) of death, toxicology results and police evidence detailing instruments or medication found at the scene were recorded.

Non-fatal self-poisonings

Consecutive cases of non-fatal deliberate self-harm were identified by a comprehensive search of casualty records at King's College Hospital, located in the centre of the coroner's court catchment area, for the first 7 months of 1991 and the first 5 months of 1994. Only hospital catchment area (n=220 000) cases were included. All drugs taken in self-intoxication, as well as regular medication taken at the time, were recorded.

Coding of substances

Substances were recorded in eight main categories: prescription-only opiates; OTC analgesics; minor tranquillizers (sedatives/hypnotics); antidepressants; neuroleptics; barbiturates; corrosives and poisons; and other miscellaneous medications. More than one category could be scored, but only one substance per category was recorded.

Analyses

Rankings of the contributions of substances to the total number of drugs taken by the groups were compared using Spearman's rank-order correlation, and were evaluated further using Fisher's exact tests (two-tailed) with significance levels (of 5%) adjusted for multiple testing (P=0.006 for 8 comparisons) (13). A similar analysis was performed using those cases from both groups where only one substance had been taken. As all of the non-fatal cases had been recruited at a hospital, we also examined whether, in the fatal cases, the ranking of substances taken differed according to the place of death.

In the second approach to analysis, the proportions of individuals in both groups who had been exposed to a given substance category were compared by means of odds ratios. The effect of drug cocktails on outcome (fatal or non-fatal) was assessed by adjustment of odds ratios for simultaneous ingestion of other substances.

Results

Fatal overdose cases

Over the 41-month period, 127 cases of fatal self-poisoning of catchment area residents were identified at the coroner's court (excluding accidental opiate overdoses among drug addicts). A total of 104 cases were considered to be definitely due to suicide, and 23 cases highly probably so. Toxicology was available for 120 cases (95%). Suicide by overdose represented 38% (127 of 335 cases) of the total 335 deaths by suicide of catchment area residents recorded during this period.

Non-fatal overdose cases

A total of 450 consecutive attendances for deliberate self-harm (DSH) (excluding accidental opiate overdoses by drug addicts) were recorded between January and July 1991. Casualty charts had been lost for 123 attendances (27%), mainly for administrative reasons (95 missing cards were part of batches of an entire week or more). Of the remaining 327 attendances, 306 attendances were for self-intoxication, of which eight were recorded as with doubtful intent. These 306 attendances represented 292 individuals.

A total of 303 attendances for DSH (excluding accidental opiate overdoses by drug addicts) were recorded between January and May 1994. Casualty charts had been lost for 24 episodes (8%). Of the remaining 282 episodes, 242 episodes involved self-intoxication, of which there were 15 cases with doubtful intent. These 242 attendances represented 229 individuals.

Those DSH attenders whose cards had been lost (123+24) did not differ significantly from the rest in terms of gender (male subjects, 44/120=37% vs. 233/521=45%; χ^2=2.31, df=1), or management received (65/147=44% vs. 211/521=41% discharged from casualty without psychosocial assessment; χ^2=0.51, df=1). The mean number of substances taken did not differ between the 1991 and the 1994 samples (1991, 1.24 (95% CI, 1.18–1.30); 1994, 1.18 (95% CI, 1.11–1.25)). No overall differences were noted between the proportions of substances recorded during the two periods (Fisher exact test, P=0.15).

The total sample of 521 (229+292) individuals was used for comparison with fatal overdose cases. If applicable, details of the first attendance only were considered.

Comparison between fatal and non-fatal overdose cases

Age and sex. Of the non-fatal cases, 233 cases were male (45%, 95% CI, 40–49%), compared with 69 of the fatal cases (54%; 95% CI, 45–63%) (P=0.060). The mean age of the non-fatal cases was 34 years (95% CI, 33–35 years) compared to 45 years (95% CI, 42–48 years) for the fatal cases (P=0.001).

Types of drugs taken — proportion of all substances recorded. Fatal outcome was associated with a higher mean number of substance types taken (Table 1) (P=0.001). Spearman's rank correlation test gave ρ=0.83 (P=0.011), indicating similar rank orders of substances in both groups. However, differences became apparent when the individual substance categories were considered. Psychotropic drugs represented 51% and 36% of substances involved in fatal and non-fatal outcome cases, respectively. Prescription-only opiates, especially dihydrocodeine (P=0.001), and antidepressants (P=0.001) represented higher proportions of drugs taken by fatal-outcome cases. OTC analgesics were under-represented among substances taken by fatal-outcome cases (P=0.001), but an excess of paracetamol–opiate combination preparations had been recorded for fatal-outcome cases (P=0.002). Fatal cases who died in hospital were compared with the total number of fatal cases, and no differences were detected with regard to the mean number of substances taken (1.52 (95% CI, 1.15–1.89) vs. 1.47 (95% CI, 1.33–1.61)) and the rank order of the substances' contribution (ρ=0.99; P<0.001).

Types of drugs taken — single-drug self-intoxications. Of the non-fatal cases, 366 cases (70%) concerned intoxication with substance(s) belonging to a single group, compared with 80 (62%) of the fatal cases. Table 2 shows the main groups of substances in subcategories for the single-substance self-intoxications. The figures in this table refer to patients. Rank orders of substances were comparable between the two groups (Spearman's ρ=0.78; P=0.023). Psychotropic drugs were detected in 39% of fatal-outcome cases and 31% of non-fatal-outcome cases. Tricyclic antidepressants were recorded in 25% of the fatal cases and 9% of the non-fatal cases (P=0.001). Paracetamol–opiate OTC combination compounds and prescription-only opiates were over-represented among fatal-outcome cases (P=0.001 and P=0.011, respectively). The reverse was true for paracetamol-only preparations (P=0.001). Minor tranquillizers were involved in 8% of fatal and 15% of non-fatal single-substance self-intoxications (P=0.075).

Lethality of substances taken singly or in combination. In this section, odds ratios for fatal outcome associated with ingestion of opiates, analgesics,

Table 1. Substances taken in fatal and non-fatal overdose[a]

Substance	Non-fatal (n=521)	Fatal (n=127)	P-value
Opiates	16 (3%)	18 (10%)	0.001
Methadone/heroin	10 (2%)	5 (3%)	NS
df118	6 (1%)	10 (5%)	0.001
Analgesics	264 (42%)	51 (27%)	0.001
Paracetamol	**139 (22%)**	**13 (7%)**	**0.000**
Paracetamol + opiates	**58 (9%)**	**33 (18%)**	**0.002**
Sedatives/hypnotics	113 (18%)	38 (20%)	NS
Antidepressants	70 (11%)	47 (25%)	0.001
Tricyclics	**52 (8%)**	**45 (24%)**	**0.001**
Neuroleptics	34 (5%)	7 (4%)	NS
Barbiturates	7 (1%)	4 (2%)	NS
Corrosives	8 (1%)	4 (2%)	NS
Other	120 (19%)	18 (10%)	0.003
Total substances	632 (100%)	187 (100%)	
Mean number of drugs	1.21 (1.16–1.26)	1.47 (1.33–1.61)	0.001[b]

[a] Proportions represent the contribution of the substance group to the total number of substances taken. Bold typeface indicates comparisons made between substances *within* the main categories.
[b] t-test; t = −4.0; df = 646.

Table 2. Substances taken in fatal and non-fatal overdose: single-substance intoxications[a]

Substance	Non-fatal (n=366)	Fatal (n=80)	P-value
Opiates	4 (1%)	5 (6%)	0.011
Analgesics	193 (53%)	5 (27%)	0.065
Paracetamol	**110 (30%)**	**9 (11%)**	**0.001**
Paracetamol + opiates	**37 (10%)**	**21 (26%)**	**0.001**
Sedatives/hypnotics	56 (15%)	6 (8%)	0.075
Antidepressants	37 (10%)	21 (26%)	0.001
Tricyclics	**31 (9%)**	**20 (25%)**	**0.001**
Neuroleptics	18 (5%)	2 (3%)	NS
Barbiturates	2 (1%)	2 (3%)	NS
Corrosives	5 (1%)	4 (5%)	0.059
Other	51 (14%)	7 (9%)	NS
Total substances	366 (100%)	80 (100%)	—
Mean number of drugs	(1)	(1)	—

[a] Figures represent the number of individuals exposed to a given substance (group). Bold typeface indicates comparisons made between substances *within* the main categories.

minor tranquillizers and antidepressants are adjusted according to whether or not other substances were taken. The unadjusted odds ratios in Table 3 refer to associations with lethal outcome irrespective of whether or not other substances (from any of the other seven categories) were recorded. Adjusted odds ratios express the association of substances with fatal outcome when taken in isolation. Adjustment resulted in increased odds ratios in the case of opiates, analgesics and antidepressants, indicating that these substances are at least as dangerous in isolation as when taken in combination with other substances. By contrast, adjustment resulted in attenuation of the odds ratio for death associated with minor tranquillizers, which suggests that the association of these substances with fatal outcome is mainly attributable to the fact that they were being taken in cocktails with other drugs.

Discussion

This comparison between substances involved in intentional overdose with fatal and non-fatal outcome, respectively, is the first study of its kind in the UK. A similar study reported from Switzerland (10), which inspired our investigation, found few overall differences between the patterns of drug usage in fatal and non-fatal self-poisoning. The similarity of the rank orders of substances in fatal and non-fatal cases in the present investigation suggests that the same situation applies in South East London. However, in contrast to the Swiss study, we found an over-representation of (tricyclic) antidepressants, prescription-only opiates and paracetamol–opiate combinations, but not of barbiturates, among substances taken in cases with fatal outcome. These patterns may, in part at least, result from differences in the prescribing and marketing of substances between the two countries (11), which may affect the availability of drugs for suicidal behaviour (12).

Table 3. Drugs in combination: associations with outcome[a]

Category	Non-fatal (n=521)	Fatal (n=127)	Unadjusted odds ratio	Adjusted odds ratio[b]
Opiates	16 (3%)	18 (14%)	5.2 (2.6–10.4)	5.7 (2.6–12.4)
Analgesics	264 (51%)	51 (40%)	0.7 (0.4–0.97)	1.3 (0.8–2.1)
Sedatives/ hypnotics	113 (22%)	38 (30%)	1.5 (0.98–2.3)	1.3 (0.8–2.1)
Antidepressants	70 (13%)	47 (37%)	3.8 (2.4–5.9)	4.5 (2.8–7.4)

[a] Figures represent the number of individuals who had taken the substance.
[b] Adjustments were made for the eight main categories of substances only.

Examination of single-substance self-poisonings, or adjustment in a multivariate model for ingestion of more than one substance, suggested that the association with fatal outcome for opiates, analgesics and tricyclic antidepressants does not depend on them being taken in cocktails, whereas this does seem to be the case for minor tranquillizers. Methods for the analysis of case-control studies were used to examine the effect of cocktails on the association between the substance taken and outcome. However, it should be noted that important confounding factors could not be taken into account, such as the presence of depression, the dose of substance taken in overdose, physical health, living arrangements (with possible bearing on the likelihood of rescue), and concomitant ingestion of alcohol. The findings of this study therefore have few direct implications for the relative merits of different antidepressant-prescribing practices, since it is likely that levels of depression and suicidal intent were higher among the fatal outcome cases than among the survivors. Nevertheless, the results do provide information about the relative danger in overdose of substances frequently taken, whether alone or in cocktails.

The fatal cases were drawn from a larger geographical area than the non-fatal cases, but the two areas did overlap. This is unlikely to have introduced bias, as the four boroughs (including the hospital's catchment area) covered by the coroner's court are homogeneously deprived inner city areas with suicide rates above the national average. A certain number of catchment area suicides and non-fatal overdoses may have been dealt with in neighbouring coroners' courts and casualty departments, respectively. This should have affected fatal and non-fatal overdose cases to the same extent, and is therefore unlikely to have biased comparisons.

It is likely that non-fatal overdoses took place in the community which did not report to hospital (14). The extent to which hospital-treated overdoses in the UK represent the 'tip of the iceberg' and differ from cases which stay at home is not known. Thus the possibility cannot be excluded that the fatal cases (representing all such cases in the area) and the non-fatal cases (representing the tip of the iceberg) were drawn from different although overlapping populations. An attempt was made to address this issue by examining whether the mean number and rank order of substances taken by the group who died in hospital differed from those for the group of dead cases as a whole. There was no evidence of this, which supports the validity of the comparisons between the (hospital-treated) non-fatal cases and the fatal cases irrespective of place of death.

The main advantage of the present study over fatal toxicity index studies lies in the high proportion of cases with toxicological analyses, which allowed an examination of the effect of 'cocktails' of drugs on outcome. Minor tranquillizers, including benzodiazepines, represented 20% of the substances detected in cases with fatal outcome but, in isolation, they were responsible for not more than 8% of fatal outcomes. The multivariate analysis supported the view that minor tranquillizers are frequently taken as part of cocktails and are associated with fatal outcome mainly as a result of their frequent combination with other drugs. This may have implications for preventive strategies aimed at polydrug users who are known to have a high risk of death through overdose, intentional or otherwise (2). Unlike the situation reported in Switzerland (10), barbiturates play only a minor role in self-poisoning in England and Wales.

It has been estimated that 4% of suicides in the UK (6) and 6% of suicides in Sweden (15) involve single antidepressants, which is consistent with the present results. Over the study period, there were 20 deaths involving a single tricyclic antidepressant out of a total of 335 suicides, i.e. 6%. Comparison with the Swiss results indicates that, in the two countries, tricyclic antidepressants represented similar proportions of drugs taken by non-fatal cases (Switzerland, 10%; South-East London, 8%) but that they were over-represented among the South East London fatal cases (24% vs. 13% in Switzerland). One explanation for this difference could be that a higher proportion of Swiss suicides than UK suicides involve methods other than self-poisoning (10).

OTC analgesics in isolation are responsible for 41% of deaths and 53% of failed attempts in this geographical area; their role in suicidal behaviour is much greater than that reported for Switzerland (10). These substances are dangerous in overdose, especially when in the form of combination-preparations containing paracetamol, which can cause delayed liver failure, and opiates, which impair consciousness and ability to mobilize early help. Annually, approximately 150 deaths and 30 000 hospital admissions in the UK are attributed to paracetamol overdoses (16). In the UK, 35% of all paracetamol is made available in combination with opiates (personal communication from the Paracetamol Information Centre). The present study raises the question of the extent to which paracetamol-related deaths may in fact be a result of the opiates frequently taken together with paracetamol in overdose. This question has public health relevance when measures to limit the general availability of paracetamol are being considered (9). Another important question raised by the present study is why this type of widely available drug should be so much more popular in overdose in the UK than in other countries.

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