

Accidental poisoning in young children

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SUMMARY Cases of accidental childhood poisoning admitted to hospital were compared with community controls and hospital controls matched for age and sex. The relative risks of factors in the cases compared with both the control groups were significant for roughness, aggressiveness, noisiness, and pica behaviour in the child, and for large families. Mothers' knowledge of the toxicity of common household products and drugs did not give significant risk differences between cases and controls. The majority of poisonings occurred during the summer months.

Mortality in England and Wales from accidental poisoning (ICD E850–929) in children aged 0–4 fell only marginally from 4.5 deaths per million in 1968 to 4.0 deaths per million in 1977.^{1,2} Morbidity, estimated by hospital discharges in this age group for the adverse effects of chemical substances (medicinal and non-medicinal) showed, with minor fluctuations, a rise from 48.7 discharges per 10 000 in 1968 to 67.1 per 10 000 in 1976.³ However, between 1975 and 1976 the discharge rates for medicinal poisonings declined whereas those for non-medicinal poisonings increased.⁴ It remains to be seen how these trends develop. McLean has suggested that, since the length of hospital stay for accidental poisoning in children has fallen, admissions in recent years have been of a more precautionary nature.⁴

Since 1 January 1976, all aspirin and paracetamol for children has had to be dispensed in child-resistant containers or enclosed in dark tinted or opaque unit packaging. Since 1976 most pharmacists have also voluntarily put all dispensed preparations containing aspirin and paracetamol in reclosable child-resistant containers. More recently, dispensed medicines and counter sales of medicines have had to be labelled 'Keep out of the reach of children' or with words of similar meaning. Since March 1981, the voluntary scheme has been extended so that all solid-dose oral preparations are now dispensed in child-resistant containers.⁵

Previous studies, carried out at different times and in different places, have investigated four main

categories of potential aetiological factors. Sibert, in Cardiff, suggested that there was more stress in families of children accidentally poisoned than in controls.⁶ Other studies have shown that the personality and behavioural characteristics of children are important factors in accidental poisoning.^{7–9} In the USA it has also been shown that accidental poisoning is not associated with increased availability and accessibility of potentially poisonous substances in the home.^{10,11} Furthermore, the American experience is that there is no difference between poisoned cases and controls in their mothers' knowledge of the toxicity of medicines and common household products.¹¹ The purpose of the present study was to examine these risk factors as comprehensively as possible in the same population.

Method

The cases studied were children aged 0–4 admitted with accidental poisoning to Dryburn Hospital, Durham, and Bishop Auckland General Hospital between July 1978 and September 1979. Accidental poisoning was defined as the accidental ingestion of potentially toxic medicines or household and other products, though the swallowing of indigestible solid items and exposure to noxious gases were excluded. Two controls, matched for age and sex, were selected for each case. A community control was chosen from the health visitor's list of children under 5 from the

same general practice as the case. A hospital control was chosen from the next appropriate child admitted as an emergency after the accidental poisoning. No children with a history of accidental poisoning were chosen as controls.

The parents of each case and of relevant controls were interviewed at home, usually within one week of the poisoning for cases and within two weeks for controls. The interview included recording a narrative of the poisoning incident in cases. Both cases and controls were given a structured questionnaire at interview, and the questionnaire included inquiries about basic demographic and social data. The child was rated for motor development using the Denver Developmental Screening Test and each child's personality was rated by the mother for 19 items using a seven-point semantic differential for every item.⁹ Parents were specifically asked about the presence of the following symptoms or behavioural characteristics: nightmares or night terrors, nocturnal enuresis, stammering, thumb-sucking, dummy-sucking, nail-biting, recent abnormal eating habits, and recent onset of behavioural problems. In addition, the interview concentrated on certain family stress factors. These were: serious illness or bereavement within the family or among close relations; mother pregnant; single-parent household, or one parent away from home; recently moved house; anxiety or depression in parents; a working mother; and another child under one year old in the home. All mothers were given a toxicology inventory in which they were required to state whether 10 different products in specified amounts were poisonous or non-poisonous for a child aged 3. The products listed were hair shampoo, cigarettes, aspirins, contraceptive pills, turpentine substitute, laburnum seeds, gripe water, Benylin, Domestos, and Diazepam tablets. The mothers were separated into three groups according to their degree of caution compared with the views of three consultant paediatricians who agreed that six of the 10 products in the toxicology inventory should be considered as poisonous. Finally, inquiries were made about where prescribed and over-the-counter drugs and potentially poisonous household products were kept in the house. The houses were inspected and the drugs and household products were defined as accessible or inaccessible to a child aged 30 months according to defined, standardised criteria. All observations and interviews were carried out by one author (DSB). For individual characteristics the relative risk between cases and both control groups was calculated using McNemar's test.¹²

Results

One hundred and twelve children aged 0–4 were admitted to the two hospitals with suspected accidental poisoning during the study period. Seventy-one (63.4%) were boys, 100 (89.3%) were aged 12–47 months, 10 (8.9%) were poisoned by drugs dispensed in childproof containers, 51 (45.5%) by other drugs, and 51 (45.5%) by household and other products. The rate of admission during the summer months (July–September), adjusted for the number of days at risk, was almost double that in other periods.

One hundred and six of the poisoned children were admitted to the case-control study; the remaining six were refusals. All 106 cases were matched with community controls and 103 cases with suitable hospital controls. The parents of five initially selected community controls and nine hospital controls refused to take part in the study and each was replaced by the next appropriate control. In both cases and controls, the acceptors and refusers did not differ significantly with respect to sex, social class, or family size.

Table 1 shows a comparison of the mother's assessment of the child's personality characteristics on a seven-point bi-polar scale between cases and both control groups. The cases were assessed as being at significantly greater risk than both control groups in terms of being rougher, noisier, more aggressive, and having a greater tendency to pica.

Table 1 *Mother's assessment of child's personality*

| Personality characteristic | Mean score | | |
|--|------------|--------------------|-------------------|
| | Cases | Community controls | Hospital controls |
| (1) Delicate—Tough | 5.34 | 5.02 | 4.76** |
| (2) Choosy—Eating well | 5.03 | 4.87 | 4.97 |
| (3) Gentle—Rough | 5.39 | 4.50*** | 4.66** |
| (4) Timid—Confident | 5.06 | 4.99 | 4.84 |
| (5) Anxious—Relaxed | 5.17 | 5.26 | 4.56** |
| (6) Quiet—Noisy | 5.93 | 5.35** | 5.38** |
| (7) Unhappy—Happy | 6.48 | 6.49 | 6.43 |
| (8) Insecure—Secure | 5.65 | 6.15*** | 5.27 |
| (9) Dependent—Independent | 5.29 | 5.40 | 4.71** |
| (10) Bad—Good | 4.93 | 5.10 | 5.56*** |
| (11) Excitable—Calm | 3.70 | 4.10 | 4.09 |
| (12) Weak—Strong | 5.72 | 5.65 | 4.73*** |
| (13) Submissive—Aggressive | 4.79 | 4.38* | 4.39* |
| (14) Passive—Active | 6.28 | 6.25 | 5.68** |
| (15) Isolated—Sociable | 5.85 | 5.83 | 5.32** |
| (16) Selfish—Generous | 4.84 | 5.03 | 4.66 |
| (17) Puts things other than food in the mouth—Does not | 3.76 | 5.08*** | 5.67*** |
| (18) Not adventurous—Adventurous | 5.87 | 5.89 | 5.33** |
| (19) Soft—Hard | 4.57 | 4.54 | 3.98** |

* $p < 0.05$
 ** $p < 0.01$
 *** $p < 0.001$ } Paired t-test

Table 2 shows the relative risk between cases and controls for social, environmental, and developmental factors. The relative risks are high and significant compared with both control groups only for large families, that is, those with four or more children. There was no increased risk associated with social class, unemployment, or inadequate accommodation (rated on defined criteria of bedroom availability for family size and pattern).

stated items as poisonous or not. Further analysis also showed that cases did not differ significantly from controls in the readiness with which they defined items as poisonous. In addition, inspection of the homes showed no significant difference in the risks between cases and controls for the presence of a locked medicine cabinet.

Discussion

In the mother's assessment of her child's personality and behaviour, our findings agree with Sibert and Newcombe⁹ with respect to putting things other than food in the mouth, although the cluster of traits represented by noisiness, aggressiveness, and roughness are also significantly associated with the cases. Being a child in a family of four or more children was a factor significantly associated with the cases, whereas other social and environmental factors did not give significant differences between cases and either of the control groups. This study failed to support the views of Sibert⁶ in that family stress was not found to be an important factor, although the two studies were carried out in different areas. Family stress requires further investigation.

There is support from this study for the findings in the USA¹¹ that parental knowledge of the potential toxicity of medicines and household products is not important, nor indeed is the apparent degree of parental caution in assessing the need for medical care. Although American experience suggests that availability and accessibility of potentially poisonous substances in the home is not associated with accidental poisoning,^{10 11} the relative availability and accessibility of drugs and household products could not be evaluated with accuracy in this study because the offending agent had been removed from the homes of the cases at the time of interview.

The preponderance of cases during the summer months, the high relative risks of large families, and the rougher, more aggressive child personalities and pica suggest that it is supervision which is most important in childhood poisoning, although it should be emphasised that this study is concerned with suspected poisoning rather than true poisoning *per se*. Case-control studies give relative risks, and further longitudinal studies would be required to determine the attributable risk, although it may be prudent for health visitors to advise families with the above risk characteristics about the need for more careful supervision during the summer months.

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Table 2 Social, environmental, and developmental factors

| Risk factor | Relative risk | |
|---|------------------------------|-----------------------------|
| | Cases and community controls | Cases and hospital controls |
| Guardian other than natural father | 1.8 | 4.7** |
| Four or more children in family | 6.0** | 6.7*** |
| Regular care by other adults | 0.9 | 0.8 |
| Poor standard of child care (Health visitor rating) | 4.0* | 0.8 |
| On observation register | 1.0 | 0.4* |
| Below normal development (Denver) | 1.6 | 3.0* |
| Manual occupation | 0.6 | 1.5 |
| Unemployed head of household | 3.0 | 0.8 |
| Inadequate accommodation | 2.3 | 1.7 |
| Presence of locked medicine cabinet | 0.9 | 1.4 |

* p <0.05
 ** p <0.01
 *** p <0.001 } McNemar's test

Specific inquiry about emotional problems or behavioural problems did not give significant relative risks compared with either of the control groups. Family stress factors did not give significant relative risks compared with either control group except for single-parent families in community controls alone (p <0.05) (Table 3). Similarly, there was no significant difference in the proportion of cases or controls with any one or more of these family risk factors.

There was no significant difference between cases and controls in the mothers' accuracy in defining 10

Table 3 Family stress factors

| Risk factor | Relative risk | |
|---|------------------------------|-----------------------------|
| | Cases and community controls | Cases and hospital controls |
| Single parent | 3.0* | 0.8 |
| Serious illness or bereavement with family or close relations | 1.4 | 0.8 |
| Mother pregnant | 1.0 | 1.8 |
| Moved house | 1.2 | 1.2 |
| One parent away from home | 0.5 | 0.6 |
| Recent onset of anxiety/depression in parents/guardians | 1.6 | 1.4 |
| Another child in family aged under one year | 0.9 | 0.6 |
| Working mother | 1.1 | 0.7 |

* p <0.05 McNemar's test

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