

Accidents among children under five years old: a general practice based study in north Staffordshire

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SUMMARY. Information about accidental injury among children under five years old was obtained prospectively by studying children registered with one general practice (total list size 9425) who presented at the surgery and/or the accident and emergency department at the North Staffordshire Hospital Centre during a 12 month period. Details were obtained from answers to a questionnaire sent to parents within two weeks of a child's accident. Of 511 children under five years of age, 100 children (57 boys, 43 girls) had 120 accidents. The maximum number of accidents occurred in the second year of life. Parents took their children directly to the casualty department in 102 (85%) accidents. Eighty six children had only one accident and four children required hospital admission. The most common cause of injury was a fall (56%). The majority of accidents happened at home (79%), and occurred between 09.00 hours and 21.00 hours (88%). Children identified in the study following an accident were matched with other children in the practice of the same age and sex who had not had an accident. Information about the families and social factors were compared. Children who had accidents had younger mothers and were more likely to have a sibling who had had an accident in the previous year. Socioeconomic factors were not significantly different between the cases and the controls. Similar numbers of families in the study and control groups had items of safety equipment and had good awareness and knowledge of accident prevention.

The results of this study cast doubt on the value of safety equipment and knowledge alone in child accident prevention. The findings suggest that it is the ability of families to put awareness and knowledge of accident prevention into effective action that is important. General practitioners, by their extended contact with families, can help to change behaviour as well as knowledge and attitudes.

Keywords: accidents; pre-school children; preventive medicine.

Introduction

THE Child Accident Prevention Trust stated that 'The home is the place where children seek comfort and security. Instead, about three-quarters of a million children suffer injury there every year.'¹ Accidents are now the most important cause of death among children aged between one and 15 years in the United Kingdom;² in 1991 551 children died as a result of an accident. Most fatal accidents among pre-school children happen at home. Fortunately, the overwhelming majority of children's

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accidents are not fatal and vary widely in severity. Studies suggest that less serious accidents are common, with one child in every five or six of the child population attending an accident and emergency department every year.³

The type of accidents for which children attend their family doctor is thought to be similar to those presented at an accident and emergency department.⁴ Studies suggest that approximately one in five of these children will be referred by their general practitioner to hospital for treatment, x-ray or admission.⁴ The majority of hospital attenders, however, are self referrals.^{5,6} The number of children who present to hospital following an accident varies in different areas of the country, for example, in rural areas, more services may be offered by general practice surgeries for the treatment of accident cases because there may be no casualty department nearby.⁷

Doctors who treat children and see the effects of the accidents are in a good position in society to alert the community to the problem of childhood accidents and to take action to prevent them.^{8,9} The introduction of a child surveillance programme by general practitioners and health visitors¹⁰ provides an ideal opportunity to make the home and the child's surroundings safer by environmental change. The representation of family doctors on local child accident prevention groups is also increasing.¹¹

Few accidents occur purely by chance. Detailed epidemiological studies of accidents to pre-school children have sought to identify causal risk factors.¹² The aim of this study was to identify the nature and extent of accidents among children under five years old at one general practice over a 12 month period and to compare the social characteristics of children having accidents with a control group, matched for age and sex.

Method

Practice

The study was conducted over a one year period from 1 January 1991 to 31 December 1991. The practice has five partners, had 9425 patients registered at the midpoint of the study and has surgeries in two locations in Newcastle-under-Lyme. The practice area has a mix of urban and rural characteristics.

Study group

Cases were defined as all children aged under five years registered with the practice who attended the surgery and/or the accident and emergency department of the North Staffordshire Hospital Centre during 1991 following an accident. Telephone contacts alone were excluded from the study. Accidents were defined as unpremeditated events resulting in recognizable injury and leading to medical examination. Cases of non-accidental injury were therefore excluded from the study. There has been pre-school accident notification and paediatric liaison health visiting in north Staffordshire since a pilot study in 1981.¹³ A register of accident notifications is held at the practice. Accidents occurring outside the district, for example while on holiday, were not included in the study.

Control group

Children identified as cases in the study were matched with other

children in the practice of the same sex and age (within one month) from the computerized age-sex register held at the practice. Four children selected as controls who later became cases were replaced by new controls, similarly matched for age and sex.

Questionnaire

Following a pilot study, a postal questionnaire with an accompanying letter was sent to the parents of all cases and controls within two weeks of the child attending surgery or the casualty department. Whenever possible a preceding telephone call was also made explaining the nature of the study. A letter was sent three weeks later to non-respondents. Follow-up telephone calls were made after a further two weeks. A third and final mailing occurred one week later. The parents of 99 cases (99%) and 100 controls (100%) had returned questionnaires by the completion of the third mailing.

The mother was asked to complete the questionnaire. The questionnaire, containing both open and closed questions, was divided into four sections, on 10 pages. The first section covered accident details of all children under five years of age in the family during 1990 and 1991. The second section asked about safety devices used in the home. Information about the family, including its social characteristics and health of the parents was obtained in the third section. The final section explored accident knowledge by structured questions and a hazard picture to assess recognition of dangerous situations.

Validation of accident reporting

In order to validate parental reports, the accidents reported by parents as having occurred during 1990 from the two groups were sought in the medical records. Notifications to the surgery of accident cases seen at the accident and emergency department at the North Staffordshire Hospital Centre during 1991 were also validated using a computerized list of attendances at the unit. There were no attendances by children under five years old at the two smaller accident and emergency departments in the district at the Haywood and Leek Moorlands Hospitals during the study period.

Social class and deprivation scores

The social class distribution in England and Wales, according to the 1981 census,¹⁴ was compared with that of the cases and controls. The catchment area of the practice was subdivided into its wards which were ranked according to the score they obtained on the overall deprivation index devised by Jarman.^{15,16}

Statistics

Results were analysed using the NCSS version 5.03 statistical package. McNemar's test was used for comparison of proportions. The Wilcoxon signed rank test was used for comparing medians of numerical variables; 95% confidence intervals were calculated using the confidence intervals statistics package.

Results

At the midpoint of the study, 511 children under five years old were registered with the practice. In the 12 month study period, 100 children (57 boys and 43 girls) had 120 accidents. Thirteen children who attended the accident and emergency department for medical reasons were not included in the study.

The age and sex of the 100 children are shown in Table 1. Eighty six children had one accident. The nine children who had two accidents were a girl less than a year old, a boy and two girls who were a year old, a girl aged three years and three boys and one girl aged four years. The children having three accidents

Table 1. Age and sex of the 100 children having accidents.

Age at time of accident (years)	No. of children having accidents:	
	Male	Female
<1	6	5
1	19	16
2	11	10
3	10	9
4	11	3

were two boys and a girl aged one year and a boy aged two years. The child who had four accidents was a girl who had the accidents when aged one and two years.

Eighteen of the initial attendances were at the practice surgery. Ten children required treatment at the surgery only. Two children were referred directly to an outpatient clinic following surgery attendance, one as a result of a burn, the second with a foreign body in the nose. Six children were referred from the practice surgery to the accident and emergency department. In 102 accidents (85.0%) children were taken directly to the casualty department by their parents. Four children required admission to hospital. Twelve children required follow up at the surgery and 15 children required follow up at an outpatient clinic. The majority of attendances at the hospital or surgery (93/120, 77.5%) required no follow up.

Timing of accidents

The occurrence of accidents in relation to the month, day of the week and time of day was investigated. It was found that 41.7% of accidents occurred in the summer months (June to September) and 105 (87.5%) occurred between 09.00 hours and 21.00 hours, the peak time of day being between 18.00 hours and 18.59 hours (30.0%). There was no consistent variation in the number of accidents according to the day of the week.

Social class and deprivation scores

The practice population had proportionately fewer people in social classes 1 and 2 (19.0%) compared with England and Wales as a whole (23.0%). The study group had only 7.0% of children with parents in social classes 1 and 2 compared with 13.0% in the control group. Investigation of those wards with the highest Jarman scores found that there was no relationship between the underprivileged area scores and the proportion of the total practice population aged under five years in each ward who had an accident.

Cause and site of accidents

The causes of accidents occurring among the children studied was investigated (Table 2). The largest single cause of accidents was falls (55.8%). The majority of accidents occurred at home (79.2%); 24.2% occurred in the living room, 12.5% in the kitchen, 11.7% on stairs, 8.3% in the bedroom, 5.8% in the bathroom, 1.7% in the hall and 15.0% in the garden. Public places accounted for 11.7% of accidents studied and only 5.8% occurred at school, nursery or play group (location of accident not known in 3.3% of cases).

Injuries sustained

The types of injuries sustained are shown in Table 3 (some children sustained more than one injury). Of all the injuries, cuts and bruises occurred most commonly among the children, with simple head injuries accounting for 28.6% of injuries; two children sustained fractures of the skull. Fractures and sprains were also an important injury. Burns represented only 3.8% of injuries.

Table 2. Cause of accidents among the 100 children.

Cause	No. (%) of accidents (n = 120)
Falls	
On same level	28 (23.3)
From one level to another	23 (19.2)
Stairs	14 (11.7)
From buildings	1 (0.8)
Other	1 (0.8)
Bumping into objects	11 (9.2)
Pulling/twisting	7 (5.8)
Foreign bodies (swallowed/in nose)	7 (5.8)
Jamming/crushing	6 (5.0)
Poisons (ingestion of)	6 (5.0)
Bicycle	5 (4.2)
Fires and heat	4 (3.3)
Cuts by sharp object	2 (1.7)
Road traffic accidents (not bicycles)	2 (1.7)
Scalds	2 (1.7)
Stings	1 (0.8)

n = total number of accidents.

Safety equipment

The total number of pieces of safety equipment owned from a list of 11 items was compared in the two groups (Table 4). Answers to questions which were not applicable to respondents, for example, stair gates not required in a bungalow, were excluded from the results. It was found that stair gates and fireguards were popular choices of safety equipment. First aid kits were owned by over 70% of families. The Wilcoxon test showed no difference between the cases and controls.

Social characteristics

The median age of 92 mothers of the study children (28.5 years, interquartile range 25 to 31 years) was significantly lower than that of the controls (30.0 years, interquartile range 26 to 33 years), (Wilcoxon signed rank test, $P < 0.05$). There was no significant difference in median family size (study group and control group families both had two children). The case and control groups had similar accident rates in 1990 (12 of the 100 children in the case group having accidents, and 15 of the control group). However, the siblings of 100 children from the study group had significantly more accidents in 1990 than siblings from the

Table 3. Types of injuries sustained by the 100 children.

Injury	No. (%) of injuries as a result of accident (n = 133)
Cuts and bruises	52 (39.1)
Head injuries (excluding skull fractures)	38 (28.6)
Sprains	7 (5.3)
Foreign body swallowed/ in nose/superficial tissue	7 (5.3)
Dislocation/subluxations	6 (4.5)
Ingestion of poisons	6 (4.5)
Burns	5 (3.8)
Fractures	
Radius/ulna	4 (3.0)
Skull	2 (1.5)
Metatarsals	2 (1.5)
Clavicle	1 (0.8)
Inhalation of smoke	1 (0.8)
Stings	1 (0.8)
Whiplash	1 (0.8)

n = total number of injuries.

Table 4. Safety equipment owned by families of the children in the study and control groups.

	% of respondents indicating ownership of safety equipment	
	Study group	Control group
Safety harness (n = 94)	86.2	77.7
First aid kit (n = 99)	74.7	79.8
Stair gate (n = 97)	72.2	80.4
Fireguard (n = 98)	66.3	63.3
Smoke alarm (n = 97)	50.5	57.7
Window locks (n = 97)	49.5	56.7
Cupboard locks (n = 98)	32.7	45.9
Medicine cabinet (n = 96)	25.0	30.2
Safety glass (n = 97)	15.5	24.7
Curly kettle lead (n = 94)	17.0	17.0
Cooker guard (n = 95)	4.2	13.7

n = number of respondents to question.

control group (10.0% of study group versus 1.0% of control group, 95% confidence interval for difference 1.9% to 11.0%, $\chi^2 = 5.82$, $P < 0.05$).

To assess family stress, an open question was asked, and to assess the presence of anxiety and depression, mothers were asked whether they or their partner had consulted the doctor for these conditions. Although several social characteristics were compared between the cases and controls, no statistically significant differences were found (Table 5). However, in the case group, a higher percentage of mothers were employed, a higher percentage of parents smoked, lived in rented accommodation, received benefits, had recently moved house or did not own a car. The mothers of the study children were more likely to have had a recent pregnancy, to have had a recent serious illness, or to report increased family stress and either parents were more likely to have been treated for anxiety or depression but the differences were too small to be significant.

Knowledge about accidents

There was no significant difference in the total scores between the mothers of children in the study and control groups in the accident knowledge questions. Among the 99 mothers in the study group responding to the question 'where is your child safest?' 31.3% correctly stated the school or nursery compared with 34.3% of mothers in the control group. Of 90 mothers in the

Table 5. Social characteristics of study and control groups.

	% of respondents	
	Study group (n = 100)	Control group (n = 100)
Single/divorced mother	14.0	18.0
Mother left school aged <16 years ^a	69.7	70.7
Mother employed	45.0	36.0
Both parents unemployed	14.0	19.0
In rented accommodation	38.0	28.0
Receiving DSS benefits ^a	34.3	27.3
Car owner ^b	72.6	81.1
Have a telephone	80.0	84.0
Recent pregnancy	23.0	14.0
Recently moved house	28.0	21.0
Anxiety/depression in one/both parents ^a	13.1	5.1
One/both parents smoke ^a	50.5	39.4
Serious illness in mother	14.0	7.0
Family stress ^c	18.4	12.2

n = number in group. ^an = 99. ^bn = 95. ^cn = 98. DSS = Department of Social Security.

study group answering 'who is most likely to have a home accident?' 44.4% correctly stated, from the options given, a four year old boy compared with 42.2% of mothers in the control group. Seventy six out of 98 study group mothers correctly identified falls as the most common home accident compared with 61 control group mothers ($P < 0.05$). Only nine out of 97 study group mothers and four control group mothers stated that most accidents at home occurred in the living room. Sixty one out of 94 study group mothers and 64 control group mothers stated that a CRC bottle cap was a child resistant cap. Of 95 study group respondents, 69.5% stated that immediate help should be sought if a child swallows pills or medicine compared with 73.7% of control group respondents. Eighty nine mothers out of 98 in each group correctly stated that not all toys have passed British safety regulations.

There was no significant difference in results for the control and study groups in identifying hazards in the picture.

Discussion

It was not possible to find any other published case control studies from general practice with which to compare overall results. The relatively small size of the groups used in this study may have resulted in a failure to detect some differences between the case and control groups.

This prospective study suggests that accidents are a major cause of childhood morbidity. The rate of one child in five having at least one accident in a year is similar to that found in other studies.⁹ As with previous investigations,¹ it was found that boys were more likely to have accidents than girls, and that the second year of life (following acquisition of walking skills) was particularly hazardous. This study looked only at those accidents which resulted in a child seeking medical attention; it is not known how many accidents went unreported.

As in previous studies there was a positive correlation between young maternal age and children who had accidents.¹² There were also significantly more previous accidents among siblings in the study group and it may be that this pattern is linked to maternal attitudes and the physical opportunities that the child is given.

Fourteen children in the study had two or more accidents in the 12 month period. In Golding's study, a higher number of accidents did not seem to be related to socioeconomic class.¹⁷ In this study the behaviour and personality of the children was not investigated but evidence suggests that, because of their temperament, some young children may be expected to have more accidents.^{18,19} It seems that children who have repeated admissions to hospital as a result of accidents may be particularly at risk.²⁰ Before these children and their families can receive effective help it is essential that an efficient system for accident notification exists and identification of those children with repeated accidents occurs. The importance of paediatric liaison health visitors in north Staffordshire has already been realized, both for children who attend the accident unit and for children who are admitted following an accident. The important role of the health visitor in accident prevention has been previously discussed.²¹

A fall was the commonest cause of an accident in this and in previous similar studies.²² Falls on the same level formed the largest group, followed by falls from one level to another; falls on stairs accounted for 12% of injuries, illustrating the importance of supervision on stairs for this age group. Although most families studied owned stair gates this number could still be improved.

Fractures accounted for 7% of injuries sustained including two skull fractures. Fortunately, there were no fatalities in this study. Evidence suggests that head injury is the most common cause of death in children aged one to 15 years.^{23,24}

As a result of these findings, a leaflet has been designed for parents giving prevention advice regarding falls, and first aid information following head injury. The usefulness of these leaflets will be evaluated in a pilot study at the practice in due course.

It was encouraging to find that over half the families studied had installed a smoke detector. Reliable, effective and inexpensive smoke detectors are readily available and can reduce morbidity and mortality from fires in the home.²⁵ The importance of some safety items cannot be underestimated.²⁶

As in other studies, a substantial proportion of children attending the accident and emergency department had conditions that could adequately be managed by their general practitioner. Family doctors are trained to deal with most minor injuries among children²⁷ and, particularly in rural areas, with major injuries too. In the course of their home visits, they may be able to point out hazardous practices or dangerous features of the house. Child health surveillance clinics also afford excellent opportunities for opportunistic child accident prevention work. The parent held child record is of particular importance for recording accidents throughout childhood and may become a focus for accident prevention advice, although its value in this respect is yet to be evaluated. Accident prone families or those vulnerable from stress or illness may be highlighted in the notes for particular attention by the primary health care team. This study suggests that although both cases and controls had similar knowledge and items of safety equipment, it is the ability of families to put this awareness and knowledge into effective action that is important for accident prevention.

The *Health of the nation* proposes that the prevention of accidents should be one of the key areas for improvement over this decade.²⁸ The government proposes to reduce the death rate from accidents among children under 15 years by at least 33% by the year 2005.

Accidents are a health problem which cannot be solved by the health service alone. However, general practitioners and their primary health care teams, who are in regular contact with children, are seen as being ideally placed to dispense advice on accident prevention and will be encouraged to do so. Accident prevention is an example of an area where the best results are achieved by cooperation and collaboration. Historically, the role of the general practitioner in child accident prevention and management has been poorly defined and presents an important topic for further investigation.

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Corrigendum — care of diabetic patients

In the paper by Parnell and colleagues (Care of diabetic patients in hospital clinics and general practice clinics: a study in Dudley, *Br J Gen Pract* 1993; **43**: 65-69) a line of text was omitted. The final sentence on page 67 and the first on page 68 should read: Hospital B, where nurses measured blood pressure at each clinic visit, achieved blood pressure monitoring for 100% of patients. A higher percentage of patients had their feet examined at the general practices than at hospital A, but less than at hospital B.

DO YOU WANT TO KNOW MORE ABOUT COT DEATH?

The Foundation for the Study of Infant Deaths National Conference 15 May 1993

There has been a large and welcome drop in cot death rates, but major questions remain: Have the rates dropped because of changes in infant care practices? What is the role of breast feeding? Does current medical research offer further clues to reductions in cot death?

This one-day conference is intended both for parents and for health professionals who want answers to these questions, and many more, from experts in cot death research. Despite the recent drop in cot death, sadly many babies still die, and there will be workshops on the role of GPs helping bereaved families, and on different aspects of family needs.

The conference will be held at the City University, London EC1. Fee for the full day is £40 including lunch. Please ring for programme and registration form: 071-235-0965 or write to: FSID 35 Belgrave Square, London SW1X 8QB.

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