INJURY TO CHILDREN IN HOME ACCIDENTS - C.P. de Fonseka and J.L. Roberts.

Introduction

This paper describes the injuries to children under 5 years derived from a research study of all home accidents in a sector of the City of Bristol, U.K., during 1970-73 (1). The objective of the research was to establish the frequency, severity and cost of home accidents in a defined community, and by use of specialist on-site investigations to establish a greater understanding of the behavioural and environmental circumstances of the events, with a view to designing accident prevention programmes.

Study design and methods

The study began in 1970, its detailed design and methods described elsewhere were based upon those previously used in a study of road accidents (2,3,4,5). We defined a study area of the resident community of nine contiguous electoral wards of North East Bristol, which had a total population officially estimated at 126,000; the population of children under 5 years was 8477, that is 7% of the total.

We defined a home accident as, "an unpleasant, unexpected and unwanted occurrence in a chain of physical events within the domestic home and garden which results in either bodily harm or material damage or both". Our positive searching system for identifying home accidents covered all family doctors, hospitals, coroners, ambulance and fire services for the area. It was designed to include all such events in the study area where the accident resulted in a death, a person seeking medical care or calling the fire brigade. We excluded from the study accidents to people visiting domestic homes who were there only in the course of paid employment. We also excluded accidents in residential institutions, hotels and boarding houses. During the course of investigation we also excluded from the study any case where the accident was principally caused by wilful actions whose outcome was intended i.e. assaults and self-inflicted injuries, except where the case involved wilful assault by or self-inflicted injury of a child under 15 years. In these latter circumstances we counted the case as an accident.

Each case was investigated on-site. 80% of the investigations were conducted within the first two weeks after the accident (1). Material from two periods of study is referred to within this paper; material from Study 1, November 1970 to March 1971, includes detailed costing data on the impact of 207 accident cases; material from Study 2, May 1971 to June 1973 covered 4439 cases, 1069 of which involved children under 5 years. It provides a more accurate measurement of age specific incidence of injury and more extensive material on the circumstances of accidents.

In Study 1 detailed investigations were carried out on a random sample of 1 in 4 of all notified home accidents in the study area by two or three members of a team lead by Dr. de Fonseka and which included doctors, nurses, economist, sociologist, engineer, statistician, technical

photographer and other members of the research staff of the Division. In Study 2, we adopted a different pattern of visiting. Every case was included for study - not just a 1 in 4 sample - and each home was visited by one of a team of nurse fieldworkers employed and trained for the study. The nurse examined the accident site and interviewed the victim, where possible, filling in a standard questionnaire: the reports from this initial visit were then used to identify classes of accident of special interest which were then re-investigated by specialists working on particular topics within the general study. Access was made to treatment, Coroners' and police records for further details and to check discrepancies. In the two studies combined we made over 500 detailed investigations and over 4600 initial home visits. This paper considers the 8477 children under 5 years in the study population and the injuries in the 1069 cases of home accidents they experienced and which we investigated in Study 2 (see Tables 1 and 2). Where necessary and possible detailed observations on-site were supplemented by on-the-spot simulation to test the story given by witnesses. Investigations were carried out in 95% of the identified home accidents in Study 1 and 84% of those in Study 2 (1).

Results

25% of all cases of home accidents in Study 2 involved children under 5 years (1). The age specific incidence in that age group is over three times higher than in those aged 65 years or more. In Table 2 we can see that in both males and females the age specific incidence of cases rises to a peak at age 1 year and falls at 4 years to a level about 50% above that in those children under 1 year of age. In each of the single year age groups 0-4 years the case incidence is higher for boys than girls. In the combined groups 0-4 years 7% of all boys and 5% of all girls per year in our study area sought medical care following a home accident. In the peak age group, those children aged 1 year, 11% of boys and 9% of girls per year became cases in our study.

Lacerations and Contusions

Examining in more detail the 1069 cases involving children we find that over half involved a principal injury classified as laceration or contusion. The 555 cases include all lacerations except those involving the brain which we have classified with concussion. In this group we found no case of laceration involving injury to the abdominal or thoracic viscera. The peak risk of laceration and contusion occurs in the boys aged 2 years and girls aged 1 year. From a clinical point of view this large group of lacerations and contusions forms a heavy load on treatment services involving skilled time and resources far exceeding that devoted to any other group of accident cases, whether from industry or from motor vehicle accidents.

No injury cases

The 104 cases of children under 5 years seeking medical care but classified as having no injury are cases of suspected injury where no injury was found on examination. This group of cases includesthose requiring foreign bodies to be extricated from the ear or nose but where

no tissue damage was involved, also those cases of suspected accidental poisoning where either the substance was not toxic, or was toxic but not taken, or was taken in non-toxic quantities. Accidental poisoning and suspected poisoning in children have been the subject of a detailed paper (6). This paper by a sociologist on the research team indicates the need for more prudent use of the health services by anxious parents and more careful clinical examination of suspected poisoning cases by medical staff to screen out the unambiguous no injury cases before initiating treatment. Calnan argues that health education should be restricted to the true risks of poisoning. Care should be taken so that future health education does not sustain the myth that true poisoning from drugs and other therapeutic substances is as great as previously considered. In our study we estimated that as few as 20% of cases of suspected accidental poisoning in children involved ingestion of toxic doses (6).

Burns and Scalds

The 154 cases of burns and scalds to children under 5 years in Study 2 represent 15% of all cases in the age group. But in children under 2 years burns and scalds are the principal injury in 22% of cases. Scalds from hot liquids especially those involving kettles of hot water used for hot drinks, personal washing and other purposes have been the subject of special study (7). Joint research with the Institute of Consumer Ergonomics at Loughborough, U.K., has now reached the stage of laboratory testing of a prototype safe kettle for domestic use.

Fractures, Concussion and Dislocation

We found that the age specific incidence of all cases in Study 2 where the principal injury was classified as fracture, concussion or dislocation was higher in children under 5 years than in adults 65 years of age or more (1). Table 2 shows that 87 (8%) of the accidents to those under 5 years in Study 2 involved fractures, concussion or dislocation (including "pulled elbow"). This group together contributed 20 of the 34 severe injury cases in this age group (see Table 3); for this purpose we used the system of classification of severity of injury developed in the Birmingham University road accident research (2,4). From our previous general work on the cost of home accidents by severity of injury we estimate that severe cases have an impact on medical care services and on the community five or six times as great as minor injury cases (1).

Table 4 shows the 87 cases of fractures, concussions and dislocations in the under fives by severity of injury and by location of the accident. Considering frequency and severity of injury together we can see that cases occurring in the sittingroom/lounge and in the bedroom when combined are a group of greater importance than those occurring on stairways. Of the 16 bedroom cases, 14 were falls from a height. Six were falls from a bed, three from cots, two from bunk beds, and three from chairs. Both children falling from bunk beds received severe fractures. If the pattern of accidents found in our study area is the same throughout Great Britain (which has a population of 4.4 million children under 5 years) there are probably 3000 cases of fracture and

concussions from free fall from beds, cots and bunk beds each year in Great Britain in this age group.

Further detailed research of the bio-mechanics of free fall within the home onto wood and concrete floors and onto alternative floor coverings could prove fruitful. Consideration should be given to the optimum heights for beds, bunks and cots and the possible use of intrinsic cushion surrounds for nursery equipment. Children playing in bedrooms, on beds and on other furniture contributed to a number of these falls. Further research is needed to consider the problem of behavioural control on play and the role of health education.

Five of the eight cases of children under 1 year suffering fractures or concussions, happened in the kitchen. In three of these cases the child fell whilst strapped in a baby chair. In children aged 1 year there were a further seven cases involving fracture or concussion from falls from chairs or high chairs. From these figures for children under 2 years we estimate that there could be as many as 3000 similar cases a year in the country as a whole involving fractures or concussion through falls from chairs and high chairs.

There were 12 cases of fractures and concussions in children under 5 years in falls on stairways in Study 2. Further specialist research is required here. Existing regulations and their enforcement in the U.K. do not adequately cover problems of safety of small children on stairways. In particular the existing Building Regulations are not adequate for handrails for children and for guardrails at the sides of stairs and on landings to prevent children falling through to the floor below.

Fatal Home Accidents

During Study 2 there were three fatal home accidents to children under 5 years in the study area; one child of 4 years died from smoke from an accidental fire, one child of 4 months died from mechanical suffocation from a pillow in a cot, and one child of 4 months died from asphyxia due to a plastic bag placed over its head. Amongst the under fives in the study area in Study 2 there were more home accident deaths than road accident deaths. It is necessary to examine a larger geographical area however to obtain a clearer picture of the distribution of different types of fatal cases. In England & Wales as a whole in 1971, there were 558 children under 5 years killed in home accidents (E850-E929 and E980-E988)[1], compared with 245 killed in road traffic accidents (E810-E819)[1,2]

The causes of these 558 deaths to children in home accidents in England & Wales in 1971 included 282 (51%) cases of suffocation either from inhalation of food or accidental mechanical suffocation, 93 (17%) cases of death in fires, 54 (10%) cases of fatal falls and 33 (6%) cases of drowning. Accidental poisoning from drugs accounted for 13 (2%) cases in the year.

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1 ICD 8th Revision

2 OPCS (1973) Statistical Review of England & Wales for 1971 Part 1 Tables 7 and 18A HMSO.

Examining in more detail the fatal road accident cases in the under fives in England & Wales in 1971, we find that 185 (76%) of the total 245 involved the child as a pedestrian, 46 (19%) involved the child as a passenger. Thus more children in this age group die from falls in the home than from injuries in motor vehicles as passengers. Case study material on fatal home accident cases is not available through any central source. A special study collating the records of home accidents from coroners courts for the country as a whole has never been financed but could provide valuable material to compare with the findings of research on largely non-fatal cases.

Discussion and Conclusion

This paper presents the findings on 1069 accidents to children in the home in a defined community. Detailed reference is made to the circumstances of impact injury. Fractures and concussions in simple falls from a height including falls from beds, bunk beds, cots, high chairs, chairs and falls on stairways account for the majority of severe injuries in this age group. The study shows that the domestic bedroom, lounge and stairway present great physical risks to children under 5 years.

In exploring the injury thresholds of the human body by the study of road accidents, researchers have concentrated resources on classes of accidents with complex mechanical and behavioural interaction. But a fracture, a dislocation or a concussion is the same whether caused in the tangle of road smash or in a fall from a bed, a chair or on the stairway at home. We believe that by studying home accidents the nature of injury and its thresholds can be explored by a clearer route. Moreover since home accidents produce more injury and death in a community than road accidents, the application of more attention and resources to this neglected field is an urgent requirement in injury prevention.

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TABLE 1

Children under 5 years in the Population at risk [1]

Frequency and percent distribution of children resident in private households in the study area of North East Bristol
Source: 1971 National Population Census at April 1971.

Age in years	Males No.	%	Females No.	%	Total No.	%
Under 1	951	22	908	22	1859	22
1	791	18	807	19	1598	19
2	844	20	809	19	1653	19
3	842	20	776	19	1618	19
4	878	20	871	21	1749	21
All ages under 5	4306	100	4171	100	8477	100

[1] The period of exposure covered by Study 2 was 104 weeks or 16954 person years. Also see footnote 2 in Table 3.

TABLE 2

Age and Sex Specific Incidence of cases by injury type - children under 5 years.

Age and sex specific incidence of children under 5 years seeking medical care after a home accident in the study area by type of principal injury found on examination. Study 2 May 1971 - June 1973.

Injury Type	MALES: Case incidence per 100,000 pop per year						Number of cases	FEMALES: Case incidence per 100,000 pop pr yr						Number of cases
	Under 1 yr.	1	2	3	4	All males under 5 years		Under 1 yr.	1	2	3	4	All Females under 5 years	
No injury	368	1201	1007	713	171	673	58	330	743	371	966	402	551	46
Laceration or contusion	999	5752	6398	4097	2847	3913	337	1101	4027	3523	3286	1435	2613	218
Burn or scald	578	2655	1303	653	171	1033	89	496	1859	742	515	344	779	65
Sprain	0	63	118	178	114	93	8	0	186	247	193	172	156	13
Fracture	263	379	533	297	285	348	30	55	310	433	451	344	312	26
Concussion	105	190	178	59	57	116	10	0	434	62	129	172	156	13
Dislocation	0	0	59	59	57	35	3	0	124	124	64	0	60	5
Other injury	158	1580	1955	831	399	952	82	330	1053	1298	580	115	659	55
All with recorded injury type	2471	11820	11552	6888	4100	7164	617	2313	8736	6799	6186	2985	5286	441
Injury type not recorded	53	126	59	59	0	58	5	55	310	0	0	0	72	6
Total case incidence	2524	11947	11611	6948	4100	7222		2368	9046	6799	6186	2985	5358	
No of cases	48	189	196	117	72	622		43	146	110	96	52	447	

TABLE 3

Severity of Injury by Injury Type
children under 5 years [3]

Frequency of children under 5 years of age seeking medical care after a home accident by severity of principal injury and type of principal injury. Study 2 May 1971 - June 1973.

Injury Type	Number of children under 5 years seeking medical care						
	Severity of Injury						
	No Injury	Minor Injury	Moderate Injury	Severe Injury	Fatal Injury	Severity not known or not recorded	All severities of injury
No injury	104	. . .	. . .	. . .	. . .	. . .	104
Laceration or contusion	. . .	520	28	3	0	4	555
Burn or scald	. . .	59	87	4	0	4	154
Fracture	. . .	6	33	17	0	0	56
Sprain	. . .	19	1	0	0	1	21
Concussion	. . .	11	7	3	0	2	23
Dislocation	. . .	2	6	0	0	0	8
Amputation	. . .	0	0	1	0	0	1
Other Injury[1]	. . .	61	66	6	3	0	136
All children with type of injury recorded	104	678	228	34	3	11	1058
All with type of injury not recorded	. . .	7	0	0	0	4	11
All children seeking medical care	104	685	228	34	3	15	1069 [2]

1 Includes poisoning, insect bites and stings, shock, injuries to teeth.
2 By multiplying any cell in this table by the factor 5.8983 it is possible to calculate the age specific incidence of cases per 100,000 children per year.

TABLE 4

Severity of Injury by location - Fractures, dislocations and concussions - children under 5 yrs.

Frequency of children under 5 years seeking medical care following a home accident involving a principal injury classified as fracture, dislocation or concussion, by location of the accident within the home. Study 2 May 1971 - June 1973.

Location of accident	Number of children under 5 years seeking medical care						
	Severity of Injury						All severities
	No Injury	Minor Injury	Moderate Injury	Severe Injury	Fatal Injury	Severity of injury not known or not recorded	
Bedroom	. . .	4	6	4	0	2	16
Sittingroom/ lounge	. . .	4	5	5	0	0	14
Dining Room/ living room	. . .	2	10	2	0	0	14
Kitchen	. . .	6	6	1	0	0	13
Stairway or upstairs landing	. . .	1	8	3	0	0	12
Garden	. . .	1	7	3	0	0	11
Steps by front or back door	. . .	1	1	1	0	0	3
Hall or passageway same level	. . .	0	0	1	0	0	1
Bathroom	. . .	0	1	0	0	0	1
Other location	. . .	0	2	0	0	0	2
All children seeking medical care	. . .	19	46	20	0	2	87