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Original Research Article

Profile of accidental injuries and poisoning in children and analysis of the predisposing factors

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ABSTRACT

Background: Accidents continue to be the leading cause of death and disability between 1 year and 15year age group. Trauma lurks both developed and developing nations but in different guises. The aim is to determine the epidemiology, clinical profile and outcome of children with accidental injuries and poisoning and to analyse the factors predisposing to accidents in children.
Methods: This was a prospective cohort study done at Institute of Social Pediatrics, Govt. Stanley Medical College, Chennai, Tamil Nadu, India between September 2006 to August 2007.
Results: Most common age group for occurrence of accident is less than 3 years n=68 (37.8%). Male children 108 (60%) outnumbered female children 72 (40%). Among the accidents falls accounted for 32.8% cases which were the commonest followed by Road Traffic Accident (RTA) 22.2%, poisoning 21.1%, Foreign body 7.8%, Burns 6.1%, Drowning 1.7 % in decreasing order of frequency. In and around Home n=114 (63.3%) was the commonest place of occurrence of accident followed by 26.7% in streets, 3.9% in schools and 3.3% in playground. Sunday contributes to more accidents (20%) than any other day. Accidents were common between 3PM to 6 PM (36.1%). Among RTA and fall, skeletal injuries accounted for 49.9% followed by head injury 27.4%, and soft tissue injuries 25.6%. Among burns, the most common site involved was limbs and deep burns were more common than superficial burns. 86.7% of cases recovered completely, 5% had permanent residual deformity and death in 1.1% of cases. The various social factors were analyzed as risk factors for accidents using multivariate logistic regression analysis and was found that nuclear family had ODD's ratio of 2.232 (95% C.I 1.004 -4.961), age of the mother <25years with ODD's ratio 1.252 (95% C.I 1.085-3.025) and socio-economic class III and IV together with ODD's ratio 1.603 (95% C.I 1.064 - 3.379).
Conclusions: Accidents and poisoning lead to significant morbidity in children in this study. Comprehensive prevention strategies need to be implemented to bring down the rate of accidents.

Keywords: Disability, Falls, Injury, Poisoning

INTRODUCTION

A safe, secure and sustainable environment is a prerequisite for a health nation. There is no sorrow, like a parents sorrow when his or her child has been killed or maimed by injury. The injuries due to accident and poisoning during childhood represent one of the most important preventable causes of morbidity and mortality.

In USA, accidents cause more deaths between the ages of 1 and 14 than the next 6 leading causes combined.[1] The most common accidents referred to hospital consist of

burns and scalds, Road Traffic Accidents, falls, poisoning, drowning, suffocation and electric shocks.

Today we are cognizant of the many facts of pediatric trauma, yet trauma to children continues unabated. The cost to society is beyond measure and the emotional losses are staggering.

The leading causes of fatal injuries in childhood were motor vehicle accidents (46%) with pedestrian injuries accounting for half of these.[2] Other leading causes of deaths include suffocation and foreign bodies (14%), fire and flames (9%), drowning and submersion (9%), falls (5%) and poisoning (3%). For every child who dies from an injury many more admitted to hospital, attend accident and emergency department or general practitioners.

Falls are the leading cause of non-fatal injuries, followed by burns and scalds and poisoning in the 0-4-year age group.[3,4]

Accidents are the end result of innumerable factors.[5] They include age, sex, personality, intelligence, imitation and parental example. They are related to the child's stage of development, mobility, ability to reach for objects, to climb, his desire to learn and explore and above all his inability to know from experience the consequences of what he is doing.

Accidents are liable to happen when the mother is at work, or caring for other baby, or attending to someone who is ill, when her attention is momentarily distracted by telephone call or she is taking tranquilizing drugs which reduces her level of alertness. Other factors include hunger, fatigue, over activity, illness at home, parental failure to understand what to expect from kids at different ages, change in environment (e.g. new house, holiday), imitation of parents, anger directed against parents, negativism and emotional deprivation. Pica is a risk factor for poisoning.

Parents have to balance the need for protection against the need for the child to learn, beginning with absolute protection at birth, finishing with nearby complete independence by 10 years of age.

Toddlers are at great risk of burns, drowning, falls and poisoning. Young school aged children are at risk of pedestrian injuries, bicycle injuries, motor vehicle occupant injuries, burns and drowning. During teenage years, there is markedly increased risk from motor vehicle occupant injuries and a new risk from intentional trauma.[3]

Poverty is one of the most important risk factor for childhood injuries. Children from poorer background are 5 times more likely to die as a result of accident than children from better off families.[6] Other factors include single parent families, teenage mother, family stress and multiple siblings.

The aim is to study the epidemiology, clinical profile and outcome of children with accidental injuries and poisoning and to analyze the factors predisposing to accidental injuries in children.

METHODS

It was a prospective cohort study done at Institute of Social Pediatrics (ISP), Govt. Stanley Medical College, Chennai, Tamil Nadu, India from September 2006 to August 2007, with a sample size 180. Study was approved by Institutional Ethical Committee of the hospital. Study group includes children from birth to 12 years with history of accident related morbidity admitted in ISP, Pediatric surgery, Orthopedics, Neurosurgery and Plastic surgery departments.

Also, children attending the outpatient department and pediatric casualty of ISP with major injuries requiring investigations and interventions were included. Neonatal birth injuries, injuries due to assault and children with minor injuries not requiring any interventions were excluded from the study.

Children with accidental injuries due to burns and scalds, Road Traffic Accidents, falls, poisoning, drowning, suffocation and electric shocks were included in study. After selecting the patient, informed consent was obtained from parents and a detailed preset questionnaire was filled followed by appropriate investigations and treatment as per protocol was done. Children were followed up till recovery or death.

Socio demographic variables are given in frequencies and percentages. Days of hospital stay and age of children are given in mean and standard deviation. Association between types of accident, type of injuries with demographic variables was analyzed using Pearson chi-square test. Day of accident, time of accident and place of occurrence were analyzed using one sample chi-square test. Prevalence of type of accident was given in proportion with 95% confidence interval. Risk factors for accident were identified using multivariate logistic regression analysis. P value <0.05 was taken as significant.

RESULTS

Total number of cases registered in this study was 180. 56 (31.1%) were treated as outpatients and 124 (68.9%) were treated as inpatients. Most common age group for occurrence of accident is less than 3 years n=68 (37.8%). 51 (28.3%) were belong to 3-6 years group, 35 (19.4%) belong to 6-9 years group and 26 (14.4%) belong to 9-12 years group. Male children 108 (60%) outnumbered female children 72 (40%).

Among the accidents Falls accounted for 59 (32.8%) cases which were the commonest followed by RTA 40 (22.2%), Poisoning 38 (21.1%), Foreign body 14 (7.8%),

Burns 11 (6.1%), Drowning 3 (1.7 %) in decreasing order of frequency. Falls were higher in the age group of 6-9 years with 15 (42.9%) cases and RTA common in 9-12 years with 11 (42.36%) cases.

Poisoning was common in the age group of less than 3 years with 27 (39.7%) cases and Foreign body in 3-6 years group with 9 (17.8%) Table1.

Table 1: Type of accidents.

Type of accident	Age group of children										Chi square test
	<3 years		3-6 years		6-9 years		9-12 years		Total		
	n	%	n	%	n	%	n	%	n	%	
Fall	21	30.9	16	31.4	15	42.9	7	26.9	59	32.8	P=0.08
RTA	6	8.8	15	29.4	8	22.9	11	42.3	40	22.2	P=0.2
Burns	5	7.4	3	5.9	3	8.6	0	0	11	6.1	P=0.69
Drowning	2	2.9	0	0	0	0	1	3.8	3	1.7	P=0.56
Poisoning	27	39.7	6	11.8	3	8.6	2	7.7	38	21.1	P=0.001
Foreign body	2	2.9	9	17.6	1	2.9	2	7.7	14	7.8	P=0.008
Others	5	7.4	2	3.9	5	14.3	3	11.5	15	8.3	P=0.61

P<0.05 is significant.

Among falls, falls by tripping at the same level accounted for 17 (28.8%) cases, from one level to another in 17 (28.8%) cases, stairs 14 (23.7%), terrace 5 (8.5%) and from moving objects 6 (10.2%).

Among the RTA pedestrian injuries were common accounting for 19 (47.5%) cases, followed by motor vehicle occupant injuries 16 (39.5%) and bicycle injuries 5 (12.5%). Pedestrian injuries were common in the age group of 6-9 years accounting for 6 cases (75%) followed by <3 years group accounting for 4 cases (66.7%) Motor vehicle occupant injuries were common in the age group of 3-6 years with 8 cases (53.3%). There is significant association between the type of injury and age group.

In accidental poisoning, hydrocarbon poisoning (Kerosene) accounted for 16 cases (42.1%), chemical poisoning 11 cases (28.9%), 1 (2.6%) case of drug poisoning, 3(7.9%) cases of corrosive poisoning and others 7 cases (18.4%) of which 2 cases of oduvanthalai leaf poisoning, 2 cases of mosquito coil, 1 case of match stick, 1 case of copper sulphate and 1 case of alcohol ingestion.

In accidental burns and scalds, 3 (27.3%) cases of burns were due to fireworks and house fire and 8 (72.7%) cases of scalds due to hot water/ drinks were documented. Drowning into bath tubs or bucket was seen in 1 case (33.3%) and into storage tank/ soakage pits were 2 cases (66.7%)

Out of Foreign Bodies, ingested foreign body (FB) was 9 cases (64.3%), FB impacted into ear/nose was 4 cases (28.6%) and FB aspirated 1 (7.1%) case. The type of FB involved is coin in 4 cases (28.6%), toys/button batteries 4 (28.6%) cases, safety pins/sharp objects 4 (28.6%) cases and vegetable matter 1 (7.1%) and others 1 (7.1%) which was a chalk piece impacted in the nose. Among the miscellaneous group electrocution accounted for 3 cases (20%), wall collapse 3 (20%), hit by moving objects 6 cases (40%) and prick by sharp objects 3 cases (20%).

Maximum number of accidents 114 (63%) were reported inside the house and its premise (Table 2).

Table 2: Place of accident.

Place	n	%	Chi square test
Inside the house	78	43.3	P=0.001
Street	48	26.7	
Within the premise of house	36	20.0	
School	7	3.9	
Play ground	6	3.3	
Others	5	2.8	

P<0.05 is significant.

Analyzing only school going children, total number of accidents on working day were 39 (21.7%) cases, and 61(33.9%) cases occurred on holidays which is statistically significant P=0.01 (Table 3).

Analyzing the time interval between accident and arrival to the hospital in our study about 118 cases (65.6%) arrived to the hospital in less than 1 hour, 37 cases (20.6%) in 2-24 hours, and 17 (9.4%) cases in 2-7 Days, 5 (2.8%) cases in 7 days to 1 month, 3 cases (1.7%) after 1 month.

On comparing the injury pattern with age group it was found that head injury was common in the age group of <

3 years with 11 cases (35.5%), soft tissue injuries in 6-9 years age group with 10 cases (34.5%) and skeletal injuries were common in the age group of 3-6 years with 21 cases (39.6%).

Table 3: Day of accident-holiday or working day.

Day	Type of accident n=100														P value
	Fall		RTA		Burns		Poisoning		FB		Others		Total		
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	p=0.01
Working day	21	56.8	12	40	0	0	1	16.7	4	40	1	8.3	39	39	CI 61%
Holiday	16	43.2	18	60	5	100	5	83.3	6	60	11	91.7	61	61	(51-700

P<0.05 is significant.

Among the head injury cases patients presenting with local scalp hematoma and laceration were 29 (85.3%), 3 (8.8%) cases presented with intra cranial hemorrhage and two cases (5.9%) presented with skull bone fracture combined with intra cranial hemorrhage.

Among the burn patients it was found that superficial burns of trunk occurred in 1 (9.1%) case and deep burns of trunk in 1 (9.1%) case, superficial burn of limbs in 1 (9.1%) case and deep burn of limbs and combined burns involving trunk, head, limbs in 4 (36.4 %) cases each. All the 3 (100%) cases of near drowning recovered without any complications.

In poisoning 8 (21.1%) cases developed respiratory, 2 (5.3%) cases developed CNS and 3 (7.9%) cases developed GIT complications. 25 (65.8%) cases of poisoning were asymptomatic without any complications. FB ingestion/inhalation presented with complication in 1 (7.1%) and without any complications in 13 (92.9%) cases.

Of the total IP cases, the mean days of admission for all the cases were 11.7 days with SD of 13.98 and all the cases clustered around 5-6 Days. Analyzing the outcome of the accidental injuries, of the total no of cases, 156 (86.7%) recovered completely, 6 (3.3%) cases had temporary residual deformity which lasted for less than 6 months which was correctable by surgery, 9 (5%) cases recovered with permanent residual deformity i.e. deformity which lasted for >6 months most of which were scars, amputations with loss of limb or finger, mal united fractures, death occurred in 2 (1.1%) cases and 7 (3.9%) cases discontinued treatment or did not turn for follow-up.

Analyzing the outcome with time of arrival to hospital, all the 3 (100%) cases arrived after 1 month had permanent residual deformity. Analyzing the social factors like family pattern, it was found that children belong to nuclear family predominates with 133 (73.9%) compared to 47 (926.1%) from joint family. 169 (93.9%) cases occurred in families with both parents living together compared to 11 (6.1%) cases from single parent family. Analyzing the age of the mother with accidents, statistically significant (p=0.046) more accidents occurred when mother's age was <25 years.

Among children of illiterate mothers 17 (28.8%) cases of fall and 15 (25.4%) cases of RTA occurred. In primary school, educated mother's falls were common with 10 (34.6%) cases followed by RTA and poisoning with 6 (20.7%) cases each. In mothers with middle school education falls predominated with 18 (40.9%) cases followed by poisoning 12 (27.3%) cases and 8 (18.2%) cases of RTA. In mothers with high school education falls again predominated with 10 (37%) cases followed by RTA and poisoning with each 6 (22.2%) cases. In mothers with higher secondary education RTA and poisoning predominated with 5 (25%) cases each followed by 4 (20%) of falls. No statistically significant association found.

Analyzing the pattern of accidents in working and not working mothers, more number accidents were documented in not working mothers 132 (73.3%) compared to working mothers 48 (26.7%) which is statistically not significant.

Analyzing the socio-economic status using Modified Kuppuswami socio economic scale's, 3 cases (1.7%) of accidents occurred in children of class II, 50 (27.8%) in class III, 123 (68.3%) in class IV and 4 (2.2%) in class V. More accidents occurred in Class III and above (OR 1.60).

Among children affected by accidents in this study 58 (32.2%) were of first order birth, 98(54.4%) second order, 19 (10.6%) third order and 5 (2.8%) above third order.

Among children affected by accidents 121 (67.2%) families had birth spacing of <3 years, 36 (20%) 3-6 years and 23 (12.8%) families with spacing more than 6 years. Alcohol abuse in family was associated with 69 (38.3%) cases and 111 (61.7%) was not associated with alcohol abuse in any family members. The various social factors were analyzed as risk factors for accidents using

multivariate logistic regression analysis and was found that nuclear family had Odd's ratio of 2.232(95% CI 1.004-4.961), age of mother <25 years with Odd's ratio 1.252 (95% CI 1.085-3.025) and socio-economic class III and IV together with Odd's ratio 1.603 (95% CI 1.064-3.379) Table 4.

DISCUSSION

In this study, the mean age of occurrence of accidents is 5.194 years (S.D-3.4years) with minimum of 10 days and maximum age of 12 years. On comparing our study with that of Murdock et al, the children in each group differed, but the children <3 years were commonly affected.[7] Male children were commonly affected (60%) in this study, which was similar to previous studies like Tandon et al Navascues et al (range 57-69%).[8,9]

Falls were the commonest type of accident in this study which is similar to the study of Murdock et al and Sitaraman et al.[7,10] Kerosene oil ingestion was the commonest poisoning in studies by Sitaraman et al and Chatterji B et al which was comparable with this study.[11,12]

Among the foreign body coin was present in 28.6% cases, safety pins and sharp objects in 28.6% cases, toys and button batteries in 28.6% followed by vegetable matter in 7.1%. The statistics were insignificant and was in contrast to the study by Asif et al in which Peanut was the commonest foreign body.[13]

Home was the commonest place of occurrence of accident in this study (63.3%) which is similar to Tandon et al 58.7% and Carter et al with 79.2% accidents in home.[8,14] Accidents were common in the time period of 3-6 PM with 36.1% cases which coincides with children returning from school and spending more time on play, which was statistically significant. More accidents were reported on holidays than school days.

In the study by Tandon et al, head injury was the major consequence of fall which was similar to this study.[8] Of the total IP cases the mean days of admission were 11.70 days with SD of 13.988 days with minimum of 1 day and a maximum of 76 days. The longest hospital stay was for RTA 21.3 days (SD 17.98), followed by burns 15.33 days (SD 9.50), fall 6.04 days (SD 3.859), poisoning 6.19 days (SD10.105) and FB 3.0 days which is statistically significant. In the study by Navascues et al the average length of hospital stay was 4.5 days, range of 1-93 days.[9]

Mortality, in this study was 1.1% slightly higher than that of Navascues et al which showed 0.5%.[9] About 73.9% cases come from nuclear families and 26.1% from joint families. This was similar to the studies by Gupta R et al in which 60% of cases were from nuclear families and 40% from joint families.[15] 6.1% cases were from single parent families and 93.9% cases from families in which both parents were living together. This was in contrast to the study of Carter et al in which single parent families accounted for 14% of cases but similar to that of Murdock et al with 8% from single parent families.[7,14]

Education status of mother matters in the incidence of accidents. The educational status data were similar to that of Gupta R et al in which 53% of mothers were illiterates, 25% undergraduates and 22.5% graduates.[15] About 26.7% of cases occurred in children of working mothers and 73.3% cases occurred in children of unemployed mothers which was statistically insignificant. This was in contrast to the study by Carter et al who showed that 45% of mothers were employed and Gupta R et al in which 54% of mothers were employed.[14,15] These statistics could not be interpreted properly as the population statistics for employed mothers in our community is not available.

Lower socio-economic growth (Class III and IV) totally accounted (98.3%) for most of the accidents, similar to study by Murdock et al with 89.5%.[7] The second child was most commonly affected by accidents in 54.4%, followed by first child in 32.2%, children above second order were least affected. This may be due to the fact that most families would be a two-child family. 67.2% of accidents occurred in families with inadequate birth spacing (<3 years) compared to 20% in families with adequate birth spacing (3-6 years) and 12.8% with >6 years of spacing.

Alcohol abuse was found in 38.3% of families compared to the study of Carter et al who found that 50.5% families had one or both parents smoking or taking alcohol.[14] The statistics on birth order, birth spacing and socio-economic class could not be interpreted without any case control study or population statistics based on our community. Factors like education status of mother, working status of mother, single parent families, alcoholism substance abuse in family, birth order of affected children did not have any statistical correlation as risk factors for accidental injuries.

CONCLUSION

Accidents were more common in the age group of children less than 3 years. Males are more commonly involved than girls in any type of accident. Falls are most common accidents followed by RTA and poisoning. Falls and poisoning are common in children less than 3 year and RTA was common in the age group of 6-9 years.

Pedestrian injuries are more common among RTA, scalds common among thermal injuries and swallowed FB is more common. Two thirds of accidents occurred in home. Accidents were more common in the week ends, most of the accidents occurred at 3-6 PM.

Head injury was common in children younger than 3 years and local scalp injuries were common than intra cranial bleeds. Lacerations and fractures accounted for

majority of wounds in older children. Majority of cases recovered completely. Accidents were more common in children from nuclear families, mother with age group <25 years and belonging to lower socio-economic class.

Accidents were more common in second birth order children and in families with inadequate birth spacing. Prevention strategies need to be implemented through education, change in environment, empowerment and enforcement to bring down the rate of accidents which costs more lives and leaves children with functional impairment, psychological stress and financial burden to the family and nation.

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