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Childhood unintentional injuries: Supervision and first aid provided

Annabel Jonkheijm, Jenny Johanna Hendrijntje Zuidgeest, Monique van Dijk, Àrjan Bastiaan van As[1]

ABSTRACT

Background: The aim of this study was to investigate the circumstances surrounding unintentional injuries of children and the appropriateness of the first aid provided by caregivers. **Materials and Methods**: This prospective study included children with aged range 0-12 years, who presented with an unintentional injury at the Trauma Unit of a hospital in Cape Town, South Africa, over a 3 month period. Caregivers were interviewed about the circumstances of the injury and the first aid provided. Experts classified the first aid as appropriate, appropriate but incomplete, or inappropriate. **Results:** A total of 313 children were included with a median age of 3.75 years. The most common causes of injury were falls (39.6%, *n* = 124), burns (23.9%, *n* = 75) and motor vehicle crashes (10.5%, *n* = 33). More than a quarter of the children (27.2%, *n* = 81) had been left under the supervision of another child below the age of 12. When the injury occurred, 7.1% (*n* = 22) of the children were unattended. First aid was provided in 43.1% (*n* = 134) of the cases. More than half of these interventions (53%, *n* = 72) were inappropriate or appropriate but incomplete. **Conclusions:** Especially young children are at risk for unintentional injuries. Lack of appropriate supervision increases this risk. Prevention education of parents and children may help to protect children from injuries. First-aid training should also be more accessible to civilians as both the providing of as well as the quality of first-aid provided lacked in the majority of cases.

Key words: Child, infant, public health, trauma, South Africa

INTRODUCTION

Injuries are usually not inevitable; the vast majority can be prevented or controlled. Injury and violence are responsible for about 950.000 deaths worldwide in children (under the age of 18 years) each year.[1] Unintentional injuries account for almost 90% of deaths. In Sub-Saharan Africa, unintentional death rates among children and teenagers are the highest in the world: 53.1/100.000 versus 38.8/100.000 globally.[2] Apart from death, unintentional injuries may result in physical, psychological and economic consequences to children, families and communities. Estimates of the annual costs of road traffic injuries, for instance, are assessed at $ 8 billion in South Africa.[3]

Numerous successful infection prevention programs have eliminated one of the early obstacles of life. However once children reach the age of five, unintentional injuries are the biggest threat to their survival.[2] Nevertheless, prevention and control programs are scarce in Sub-Saharan Africa.[4] Childsafe South Africa (formerly known as the Accident Prevention Foundation of Southern Africa) was founded in 1978 and remains the only pioneer in child safety. The vision of Childsafe South Africa is to reduce accidental and non-accidental childhood injuries through research, education and advocacy.[5]

The five most common unintentional injuries in South African children are, in descending order: road traffic injuries, burns, drowning, poisoning and falls.[4] The risk of injury varies by age, gender, race and socio-economic status.[2] Children under the age of six are the most susceptible, because they have not yet developed the ability to assess dangers in their environment and are, therefore, completely dependent on their caregivers for protection.[6,7] Lack of supervision, a single caregiver, substance abuse of the caregiver and being from large families are factors that increase the risk for injuries.[2,4] Several studies indicate that children with low socio-economic status are more susceptible to unintentional injuries[8-10] and their parents have been found to spend less time supervising their children.[11,12] The income of the parents also plays a role in prevention; many poor families cannot afford protective measures, such as car seats, window guards and temperature regulation taps.[2]

Department of Paediatric Surgery, Erasmus MC Sophia Children's Hospital, Rotterdam, The Netherlands, [1]Department of Paediatric Surgery, Red Cross War Memorial Children's Hospital, University of Cape Town, Cape Town, South Africa

Address for correspondence:
Mr. A. Jonkheijm,
Sourystraat 24c, 3039 ST Rotterdam, The Netherlands.
E-mail: annabeljonkheijm@gmail.com

In South Africa, there is a large income gap between poor and rich; the Gini Index of South Africa is the highest in the world (2009).[13] The gross national income per capita is $ 6100 and 23% of people live under the national poverty line.[13] 33% of the population live in informal settlements.[14] Only around two-third of the children (68%) enrol in secondary school and the unemployment rate is 24%.[13] First-aid courses are not free of charge in South Africa. Unfortunately, these courses are not yet implemented in the curriculum of the primary or secondary schools. Day care teachers and school teachers may enrol for courses through private companies and Childsafe South Africa, but it is not mandated.[5]

The majority of studies on unintentional childhood injuries concentrate merely on mortality data and therefore represent only the tip of the iceberg regarding childhood injuries. Detailed information about the aetiology of child trauma has been documented, but thoroughly documented reports from the developing world, where the vast majority of child trauma occur, are scarce.[2] The present study focuses specifically on non-fatal unintentional injuries. The aim of the study was to assess the circumstances of unintentional injuries, in particular, the supervision present when the injury occurred and the appropriateness and quality of the first aid provided.

MATERIALS AND METHODS

The study population was defined as the caregivers/attendants who accompanied children aged 0-12 years with an unintentional injury to the Trauma Unit at a hospital in Cape Town during a 3 month period, from June 2011 to August 2011. From the age of 13 onwards, children are treated in adult hospitals. A caregiver was defined as the guardian of the patient. An attendant was defined as he or she who accompanied the patient, but was not the guardian.

All children presenting with intentional injuries as well as follow-up patients were excluded from the study. All participants without command of the English language were offered the assistance of an interpreter.

The Ethics Committee of the University of Cape Town approved the study.

The caregivers/attendants were interviewed by one of the two researchers using a questionnaire comprised of three sections. The first part inquired to the nature and severity of the injury, involvement of substance abuse, provision of first aid and supervision at the time of the accident. The second section included information concerning the caregiver's age, education, employment status and living circumstances. The third portion described the patient and their activity at the time of injury.

Interviews were conducted on 3 randomised days (during the day and night hours) each week for a 7 week period, resulting in a total of 21 days of data collection, in which every day of the week was represented equally.

After physical examination, the trauma surgeon on call assessed the eligibility of the patient and the caregiver to be involved in the study. If eligible, informed consent from the caregiver was obtained by the researcher, who then immediately administered the interview.

If the patient had received first aid after the incident, details were described in the survey. The quality of first aid was assessed retrospectively by two researchers. A second opinion on the first aid was obtained from the head of the trauma unit in all cases. Information from the Trauma Unit's records served to assess whether the information provided was consistent.

Data analysis

Descriptive statistics were used to present the results. Normally distributed variables were presented as mean (standard deviation), non-normally distributed variables as median (interquartile range). Statistical Package for the Social Sciences 17.0 (SPSS Inc. Released 2008. SPSS Statistics for Windows, Version 17.0. Chicago: SPSS Inc.) was utilised for statistical analysis.

First aid provided was classified into one of three categories: inappropriate, appropriate but incomplete, or appropriate. The interrater reliability between the two researchers and the Head of the Trauma Unit was estimated with the linearly weighted Cohen's kappa.[15] The classification by the head of the unit was utilised for evaluation when a discrepancy existed.

The Fisher's exact test was used to measure the association between first aid and the educational level of the caregiver. To obtain a better distribution, the educational level was recoded into two categories; 1 = no education or primary school only, 2 = college and university. The Kruskal-Wallis test served to analyse first aid and employment status of the caregiver.

RESULTS

A total of 313 children were included (boys 66.8%, $n = 209$) with a median age of 3.75 years (Inter quartile range [IQR] 1.83-7). Background characteristics are listed in Table 1.

The three most frequent unintentional injuries in children were falls, burns and motor vehicle crashes, 39.6% ($n = 124$), 23.9% ($n = 75$) and 10.5% ($n = 33$), respectively [Table 1]. In children between birth and 3 years of age, hot water burns occurred most frequently ($n = 44$, 33.1%); in those 4 years and older, falls were the most common (47.3%, $n = 35$ [3-6 years]; 47.5%, $n = 29$ [6-9 years] and 44.4%, $n = 20$ [>9 years]).

In 93.9% of the cases ($n = 294$), the patients were accompanied by their caregivers at the time of admission. Someone who was not their guardian (i.e. an uncle, aunt, grandmother or sibling) accompanied 5.8% ($n = 18$) of the patients. One patient was not accompanied by anyone. No patients were missed on the study days.

In 179 cases (56.9%), no first aid was provided. In 134 cases (43.1%), first aid was provided, of which 46.3% ($n = 62$) were classified as appropriate, 38.1% ($n = 51$) as appropriate, but incomplete and 15.7% ($n = 21$) considered as inappropriate or detrimental. Examples of inappropriate forms of first aid were: The application of ice, chalk, or eggs on burns; reduction of a dislocated joint by the caregiver; and the provision of food after swallowing a foreign body. Table 2 documents the rating of the first aid provided for each type of unintentional injury.

The linearly weighted Cohen's kappas of classifying the quality of first aid between the two researchers separately and the head of the unit were 0.73 and 0.68. Differences in classification were primarily found in the first aid provided for burns and foreign bodies.

Nearly 60% ($n = 188$) of the injuries occurred in or around the house; 23.1% ($n = 72$) in public areas or on the road; 11.5% ($n = 36$) occurred at school or day care; 5.1% ($n = 16$) happened at other locations. In one case, the place of injury was unknown. The peak incidence of the injuries (51.8%, $n = 145$) was between 12 and 18 h in the afternoon [Table 1]. Of all injuries, 92.9% ($n = 289$) occurred while another person was in the vicinity of the child and in 39.9% ($n = 124$), this person was the caregiver. In 27.2% ($n = 81$) of the injuries, the children were left under the supervision of another child below the age of 12. In 7.1% ($n = 22$) of the cases, the children were

Table 1: Background characteristics

Characteristic	*N* (%)*
Age in months, median (IQR)	45 (22-84)
Boy, girl	209 (66.8), 104 (33.2)
Type of injury	
Fall	124 (39.6)
Burns	75 (23.9)
- Hot water burns	−58 (18.5)
- Other burns	−17 (5.4)
MVC	33 (10.5)
- MVC pedestrian	−28 (8.9)
- MVC passenger	−5 (1.6)
FB	19 (6.1)
Pulled elbow	14 (4.5)
Animal bite	6 (1.6)
Other	42 (13.4)
Total	313 (100)
Time of injury	
Morning (6-12)	52 (18.6)
Afternoon (12-18)	145 (51.8)
Evening (18-24)	80 (28.6)
Night (24-6)	3 (1.1)

*Unless otherwise stated. IQR: Interquartile range; MVC: Motor vehicle crashes; FB: Foreign body

Table 2: Rating and method of first aid provided

Type of injury	Rating first aid	Examples of type of first aid	*N*
Burns	Inappropriate	Eggs, margarine, chalk, ice and dry dressing	12
	Appropriate but incomplete	Cold water towel, vaseline, topical antiseptics only	5
	Appropriate	Cold (running) water, burn shield	33
FB	Inappropriate	Food or drinks after ingestion	5
	Appropriate but incomplete	Try to remove FB from nose/ear	9
	Appropriate	Not seen	—
Open wound	Inappropriate	Not seen	—
	Appropriate but incomplete	Ointment, covered wound, wound pressure, cold dressing, disinfection, ice pack	17*
	Appropriate	Disinfection, bandage and ointment, ice pack	12*
Fracture/ dislocation	Inappropriate	Reduction of dislocation by the caregiver, vinegar cloth, menthol rub	4
	Appropriate but incomplete	Sling, ice pack, ointment, bandage, painkillers	17
	Appropriate	Ice pack, bandage, backslap, painkiller, vaseline, disinfection	12
Brain injury	Inappropriate	Not seen	—
	Appropriate but incomplete	Water in face to wake up, remove food from mouth at seizure, keep patient awake	7
	Appropriate	First aid from school nurse/doctor/ ambulance worker, ice pack, painkillers	8

*This included patients with wounds as well as brain injury. FB: Foreign body

alone when the injury occurred; those children had a median age of 5.58 years (IQR 2.75-10.08). In 60.4% of the cases (n = 180), the child was supervised by an adult over the age of 18 years, either the caregiver, another family member, or a teacher. In 15 cases, the age of the supervisor was unknown [Figure 1]. None of the respondents reported an injury involving substance abuse.

Information about the referral was available for 300 patients. Nearly 63% (n = 189) of those were referred from another hospital, 19% (n = 57) were self-referred, 9.3% (n = 28) were initially treated by a general practitioner, 7.7% (n = 23) were referred by ambulance personnel and 1% (n = 3) by other means.

Regarding transportation, 41% (n = 128) arrived at the hospital by ambulance, 33% (n = 103) by their own means of transport and 22.8% (n = 71) by public transport.

The median time between injury and arrival to the hospital was 4.5 h (IQR 1.75-18.5 h). 34% (n = 18) of self-referred patients arrived within 1 h of the injury; the majority of referred patients from other hospitals arrived between 5 and 12 h after the injury (n = 38, 22.6%).

Nearly 61% (n = 178) of the patients lived in a brick house, while 38.8% (n = 113) lived in an informal settlement. Electricity was available in 91.6% (n = 283) of the houses. Almost a quarter of households (24.9%, n = 77) did not have running water inside; instead, water was used from a community shared tap. The number of people living together in one house varied between 2 and 17, with a median of five (n = 307). More than half of the children (n = 179, 57.4%) lived with both parents, 33.7% (n = 105) lived with only one of their parents and 7.4% (n = 23) lived with other relatives.

More than half of the caregivers (n = 162, 54.4%) had not finished secondary school. 34% (n = 103) had finished secondary school; 3.7% (n = 11) and 2% (n = 6), respectively, attended college or university. A higher quality of first aid was associated with higher educational level of the caregiver (P = 0.03, Fisher exact test). Inappropriate first aid was provided in 18.8% (n = 3) of the lowest educational level (none or primary school) and in 6.3% (n = 1) in the highest educational level (college or university). Appropriate first aid was not provided in the lowest educational level and in 50% (n = 8) of highest educational level [Figure 2].

Age supervision* age in months crosstabulation

Count					
	Age in years				
	0-3 years	3-6 years	6-9 years	Older than 9 years	Total
Age supervision					
Nobody	2,0%	1,7%	1,3%	2,3%	7,4%
0-12 years	4,4%	7,4%	8,1%	7,4%	27,2%
13-18 years	2,3%	,3%	1,0%	1,3%	5,0%
19+ years	33,6%	14,4%	9,1%	3,4%	60,4%
Total	42,3%	23,8%	19,5%	14,4%	100,0%

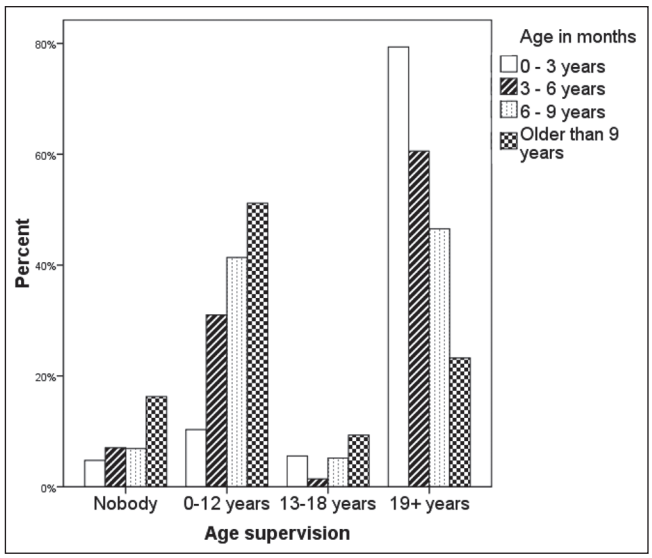


Figure 1: Age supervision and age of the patients

DISCUSSION

First aid was provided in less than half of the cases but more than half of these interventions (53%) were judged inappropriate or incomplete. Assessing the quality of first aid provided proved difficult as shown by the interrater reliability.

Considering that one-tenth of the injuries happened at school or day care, it may be beneficial to make first aid courses mandatory for teachers. Implementation of first aid courses during the high school curriculum, or already in primary school, should be strongly considered as research indicates that even children as young as 4 or 5 years of age are already able to learn basic first aid.[16] This would contribute to a more injury-resilient and healthier population. Detrimental or inappropriate treatment such as applying eggs or margarine to cure burns could then be avoided.[17]

Studies show various results regarding the prevalence of first aid provided. Karaoz *et al*. (Turkey) demonstrated

First aid article* education groups crosstabulation

Count

	Education groups				
	None or primary school	Secondary school unfinished	Secondary school	College or university	Total
First aid					
None	10	99	54	5	168
Inappropriate	3	8	8	1	20
Appropriate but incomplete	3	26	18	2	49
Appropriate	0	28	23	8	59
Total	16	161	103	16	296

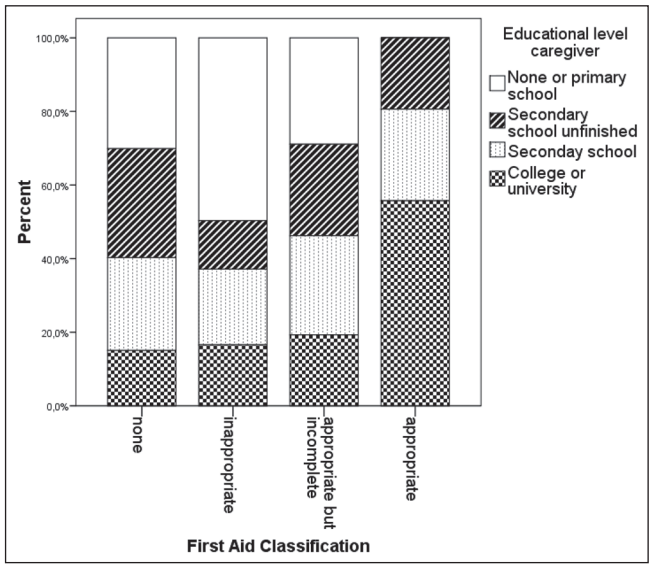


Figure 2: The first aid provided and the educational level of the caregiver

that first aid was provided in almost 90% of cases,[18] which is in sharp contrast with our results. More in line with our results is a study in Ghana where 33% of patients presented to the hospital without prior first-aid treatment[19] as well as a study in the USA in which 23.7% of patients did not receive first-aid treatment.[20] Poor living circumstances may also contribute to the absence of first-aid care. For instance, the lack of running water in-house will preclude the initial management of a burn injury.

The top three major mechanisms of injuries in children according to the literature were confirmed in our study, albeit in a different ranking.[1,2] From all unintentional injuries, remaining as major threats to children's survival are falls, burns and motor vehicle crashes. Intervention programs should primarily focus on these three mechanisms of injury. In this study, only children below the age of 13 were included. This may have caused the shift in the ranking of the most common injuries, as children above the age of 13 are more often involved in motor vehicle crashes.[2,4,21]

Children most at risk for unintentional injuries were between 0 and 3 years of age. Boys tended to be involved in unintentional injuries twice as often as girls, comparable with other studies.[2] Cases of drowning were not included in this study since they are not treated in the surgical Trauma Unit.

Children are more vulnerable for injuries in the afternoon in or around the home, as well as on public roads.[4] This suggests that children are most at risk after attending school, travelling home, or while playing on the street. Therefore, schools can play an important role in prevention, for example, through school patrols and providing supervision for the children while crossing the streets around the schools.

The majority of injuries happened under the supervision of an adult, but in more than a quarter of cases, the children were left supervised by children below the age of 12. In order to prevent childhood injuries, parental supervision is crucial and should be encouraged, in particular with young children. Caregivers tend to overestimate the ability of their children to act safely in traffic-for instance the ability to cross roads by themselves-but under the age of six, children are neuro-developmentally immature and do not possess the ability and skills to adequately assess environmental dangers.[6,7,22] Community-based prevention programs are essential and should be put into practice through churches, community centres and other communal institutions to teach parents and caregivers about these topics.[22]

Substance abuse was denied in all cases. This is remarkable as other studies showed that substance abuse was involved in at least half of traffic incidents and other unintentional injuries.[4,21] Due to the negative sentiments associated with substance abuse, we may assume that caregivers could possess a high threshold for disclosure.

Most of the patients stemmed from circumstances with relatively poor socio-economic statuses, with more than half of the caregivers unemployed and uneducated. One-third lived in shacks and one quarter did not have access to running water in their homes. There are many ways how this could affect the incidence of unintentional injuries and the first aid provided. A significant association was found between the educational level of the caregiver and the quality of first aid provided. The lower the educational level, the more inappropriate first aid was provided, or no first aid was provided at all. There was no significant association between first aid

and age of the caregiver. More than half of the patients' caregivers did not finish their secondary school. In order to reach the majority of the population, it may be necessary to implement prevention programs early on in high school (before pupils drop out). In winter season especially, prevention programs should focus on burn prevention. The majority of children were burned by heaters, hot water kettles and hot bathwater. Parents should be fully alerted to these facts and remove electric wires and keep kettles out of reach of children. Children from poor background are known to be at higher risk of being injured than children from wealthy families.[1,4,23]

Some limitations of our study need to be addressed

First, the present study is a single-centre study and data from private hospitals are lacking; therefore, a comparison between the poor and wealthy children cannot be made properly. Second, interrater reliability between the head of the unit and researchers was acceptable, but not ideal. This also demonstrates the difficulties in distinguishing between appropriate, incomplete and detrimental first-aid methodologies. Third, the severity of injuries was not rated and therefore, some potential associations (i.e. lack of supervision and severity of injury, or the provided first aid and the severity of injury) cannot be made.

In conclusion, unintentional injuries are a serious threat to child survival. Parents and caregivers should be made more aware of the risks for childhood injuries in their surroundings and should be empowered to urgently improve childhood safety.

The knowledge of first-aid treatment should be more widely spread within the population, as only half of the children did receive first aid, was approximately 50% assessed as inappropriate and/or detrimental.

We need to urgently establish a knowledge base for effective prevention programs. Future studies should focus on the best ways to implement such programs and to measure their effectiveness.

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