

BURN INJURIES AMONG CHILDREN ADMITTED AT WEBUYE COUNTY
HOSPITAL: PATTERNS AND MANAGEMENT OUTCOMES

BY

DR DAVID MUKABI MUBASHI

SM/PGFM/07/11

THESIS PRESENTED IN PARTIAL FULFILLMENT FOR THE AWARD OF THE
DEGREE OF MASTERS OF MEDICINE, FAMILY MEDICINE [MMed-FM] OF MOI
UNIVERSITY, ELDORET

MARCH 2015

DECLARATION

Declaration by candidate:

This thesis is my original work and has not been presented for a degree course in any other university. No part of this thesis may be reproduced without the prior permission of the author and / or Moi University.

Sign:----- Date:-----

Dr David Mukabi Mubashi

Declaration by the supervisors:

This thesis has been submitted to Moi University with my approval as University Supervisor.

Sign:.....Date:.....

Dr. Ray Downing

Department of Family Medicine, Moi University School of Medicine

Sign:----- Date:-----

Prof. Robert K Tenge

Department of surgery, Moi University School of Medicine

ACKNOWLEDGEMENT

My sincere thanks go to the Ministry of Medical Services for granting me study leave, and Moi University for the Sponsorship for my training. The Principal, College of Health Sciences Moi University, Dean, Moi University School of Medicine, the head, department of Family Medicine and the Hospital Management Team, Webuye County hospital for allowing the study to be conducted in the hospital.

DEDICATION

To my children, Maria and Jose and My Wife Valentine. Your presence was a constant reminder that I needed to give out my best.

ABSTRACT

Background: Burn injuries constitute a major public health problem and are among the leading cause of childhood morbidity and mortality worldwide. They represent an extremely stressful experience for both the burn victims as well as their families. There is paucity of published data on the epidemiology of childhood burn injuries in Western Kenya, which would be useful in making recommendations on appropriate preventive measures and management of the injuries.

Aim: This study was conducted to describe the patterns and management outcomes of children with burn injuries admitted at Webuye County Hospital

Methods: A descriptive study of children with burn injuries was conducted at Webuye County Hospital (Western Kenya) over a one-year period from April 2013 to March 2014. Data was collected using a pre-tested coded questionnaire and information on management outcome extracted from the patient files upon discharge. Study population consisted of children 12 years and below admitted with burn injuries and all eligible participants were enrolled into the study. Statistical analysis was performed using SPSS software version 17.0

Results: There were 60 participants. Females consisted of 51.7% while 85% were aged 5 years and below. Majority of the burn injuries occurred at home in the absence of the caretaker. Scalds were the most common cause of burns accounting for 53.3% while the trunk was the most commonly involved body region in 57% with a mean TBSA of 10%. The rate of burn wound infection on admission was 10%. Surgery was performed in 16.7% while the rest were managed conservatively. The average length of stay (LOS) was 11.6 ± 4 days. Fatality rate was 5%.

Conclusion: Most childhood burn injuries occur at home and affect younger children. Majority of the injuries are scalds. Pre-hospital interventions are inadequate. The main short-term complication is scarring and the mortality rate is 5%.

Recommendations: There is need to educate the community on childhood burn injury prevention, improvement of home safety measures and adequate supervision of young children. There is also need for education on appropriate pre-hospital first aid care for burns.

LIST OF ABBREVIATIONS

ATLS- Advanced Trauma Life Support

FAT- First Aid Treatment

HIV – Human immunodeficiency Virus

LOS- Length of Stay

TBSA- Total Body Surface Area

WCH- Webuye County Hospital

WHO- World Health Organization

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CHAPTER 1: INTRODUCTION

1.1 Background

Burn injuries constitute a major public health problem and are a leading cause of unintentional injury in developing countries. They account for 9.1% of all unintentional injuries among individuals aged less than 20 years and are ranked 11th as a cause of unintentional injuries in individuals under 10 years old (Peden, Oyegbite and Ozanne-Smith, 2008). In 2004 the World Health Organization (WHO) estimated that 310000 deaths were caused by burns, 30% of which occurred in individuals under 20 years (World Health Organization, 2008).

Children are at a higher risk of death from burns because their injuries differ in multiple aspects from those of adults. They have a relatively thinner dermis and so, for any given thermal insult a child will sustain deeper burns than an adult. Children also tend to have worse burns in terms of extent and depth, and because of their larger body proportions, they experience greater water and heat loss. It is estimated that 3.9 out of every 100000 children die worldwide as a result of burn injuries as has been shown by Peden et al. (2008). The rates in developing countries are higher with estimates of 4.3 per 100000 compared to 0.4 per 100000 in developed countries. In Kenya the World Health Organization rated burns as the 4th leading cause of deaths due to unintentional injuries in individuals aged 0-14 years (WHO, 2008).

The risk of fatality increases with decrease in age. In developing countries, Gome, Mutiso and Kimende (2005) found that the majority of patients admitted with burns are less than 5 years old. Burn injuries have been ranked as second most common cause of accidental death in children younger than 5 years and the most common cause of accidental death in the home (Harmel, Vane & King, 1986).

The management of childhood burns and their consequences remains demanding and extremely costly even in well-equipped, modern burn units (Atiyeh, Costagliola & Hayek, 2009). However, in most developing countries, late presentation to health facilities, lack of well-equipped burn centers and trained medical personnel for treatment and rehabilitation of burn injury patients contributes significantly to increasing morbidity and mortality as found by Dongo, Irekpita, Oseghali, Ogbebor and Iyamu (2007).

The outcome of burns is greatly influenced by the quality of care that patients receive. Inadequate public education, injury prevention and control measures coupled with absence of pre-hospital care and ineffective ambulance system for transportation of burned patients to specialized burn centers are important factors responsible for most of the deaths in cases of critical burns (Aysun, Ali, Alpa & Kaya, 2009).

1.2 Problem statement

Burn injury remains a major cause of morbidity and mortality in the developing countries. Inadequate public education, injury prevention and control measures coupled with lack of resources in poorly funded health facilities compound the poor outcomes seen. These injuries and their associated complications cost less to prevent. An understanding of the epidemiology of burns in children is essential for a focused prevention strategy applicable to our local environment. Unfortunately, relevant and accurate data regarding these injuries is sketchy and incomplete, particularly in the developing world.

1.3 Justification of the study

Childhood burn injuries place an enormous socio-economic burden on individuals, their families and health services. Significant physical and psychological sequelae are associated with non-fatal burns with survivors requiring ongoing treatment and rehabilitation. Throughout the treatment phase, childhood burn injuries are susceptible to increased severity, deterioration and other complications.

Admissions of children with burn injuries at Webuye County Hospital have been on the rise. Review of hospital records indicates that there has been a 30% increase in pediatric burn injury admissions from 2009 (50 cases) to 2012 (65 cases). Mortality rate has also increased over the same period from 4% to 7.6% respectively. The records are also not clear on the actual cause of these deaths.

This study was therefore undertaken to address the scarcity of valid data on the epidemiology of burns in children at Webuye County Hospital. It describes the risk factors and injury patterns as well as highlighting the outcomes of management at the hospital.

1.4 Research question

What are the patterns and management outcomes of children with burn injuries admitted at Webuye County Hospital?

1.5 Objectives

1.5.1 Broad objective

To describe the patterns and management outcomes of children with burn injuries admitted at Webuye County Hospital

1.5.2 Specific objectives

1. To describe the patterns of burn injuries in children admitted at Webuye County Hospital
2. To describe the management outcomes of children with burn injuries admitted at Webuye County Hospital

CHAPTER 2 LITERATURE REVIEW

2.1 Patterns of burn injury in children

Globally, scalds are the most commonly treated burns that generally result in a less severe injury and rarely require a lengthy hospital stay (Burd & Yuen, 2005). They may be superficial, deep or a combination of both. In Kuwait, 67% of childhood burns are scalds followed by flame as found by Sharma, Al Fadhli and Bang (2006). Similarly, in Tanzania Chalya, Mabula and Dass (2011) found scalds to be most prevalent accounting for 56.1% of burn injuries in children. The trunk was the most affected body region in 57.3% while the mean total body surface area (TBSA) was 16.24%. At the Rift Valley Provincial Hospital, Nakuru (Kenya), a review by Oduor (2010) found scalds to be the most common childhood burn injuries occurring in 90.2%. Multiple sites were involved although the upper limbs were the most affected in 56.3%. A study by Mutiso, Khainga and Muoki (2014) at a paediatric private hospital in Nairobi (Kenya) showed that scalds accounted for 84.2% although majority (70.5%) of the injuries had total body surface area affected less than 10%.

While there are enormous variations in the ages of patients with burn injuries children under 5 years have the highest incidence as has been shown by Aysun et al. (2009). The high incidence of burn injuries in this age group is attributable to children's impulsiveness, lack of awareness, higher activity levels, natural curiosity and total dependency on their caregiver (Forjuoh, 2006). In Kuwait, Sharma et al. (2006) found out that 70.7% of children with burn injuries were aged 0-4 years. In their study in Tanzania, Chalya et al. (2011) found the mean age to be 3.21 years \pm 2.42. Children less than 2 years old accounted for 45.9%. Studies in

Kenya have shown a picture similar to regional studies. Mutiso et al. (2014) found 84.6% of burn injuries occurred in children aged 0-5 years.

Globally, majority of children sustaining burn injuries are boys with a male to female ratio of about 2:1 (Burd & Yuen, 2005). Studies in Tanzania by Chalya et al. (2011) and Mutiso et al. (2014) have shown similar findings with males contributing to 57.9% and 59.7% respectively. The exploratory behavior in boys in earlier years has been postulated to contribute to the higher incidence in males (Dissanaike & Rahini, 2009).

Majority of burns occur within the home from food preparation, food consumption or bathing activities and are deemed largely preventable (Albertyn, Bickler & Rode, 2006). The risk of burn injuries in developing nations is primarily associated with the type of material providing fuel for cooking and type of cooking implement used. Unstable pots and stoves are associated with significant proportion of injuries as Dissanaike, Boshart, Coleman and Wisher (2009) found.

There is growing evidence that burns are associated with being socio-economically disadvantaged. Factors such as education, income, knowledge of burn prevention and care, supervision and features of the home are significantly related to burns (Poulos, Hayen, Chong & Finch, 2009).

Underlying health problems increase the risk for burns and influence health outcomes. In Africa, epilepsy and non-compliance to anticonvulsant medication increase the risk of falling into open fires as found by Albertyn et al. (2006). Other documented risk factors associated

with burns in children include overcrowding, mother pregnant, recent family relocation, lack of parental supervision, lack of fire and flame enclosure, presence of physical impairment or disability, history of sibling dying from burns among others (Rayner & Prentice, 2011).

Burns can be classified as accidental and non-accidental. Although non-accidental burns in children are presumed to be due to child abuse, correct estimation of child abuse among burn patients is difficult to establish due to reporting bias. Non accidental burns account for as many as 20% of burn unit admissions in the US as Rayner and Prentice (2011) demonstrated. In Tanzania, Chalya et al. (2011) found that child abuse accounted for 2.9% of burn injuries. In Uganda Nakito and Lett (2010) found intentional injuries accounted for 16% of all childhood burn injuries. Often the parents to the injured children have high rates of alcohol and drug abuse (Burd & Yuen, 2005).

2.2 Management outcomes of children admitted to hospital with burn injuries

Although mortality from serious burn injuries has declined in the developed world due to advances in burn care and implementation of prevention strategies (Rayner & Prentice, 2011), children with moderate and severe burns require intensive treatment and often experience scarring and long term disability. In the developing world however, lack of infrastructure and traditional methods of treatment contribute to unsatisfactory state of overall burn management, prevention and rehabilitation of burn survivors (Albertyn et al. 2006). Varying rates of mortality and length of hospital stay (LOS) have been reported. In Germany, Langer et al. (2006) reported a mortality of 1.4% while in Tanzania the average length of stay was 22.12 ± 16.62 days while the mortality rate was 11.7% (Chalya et al. 2011). In Kenya

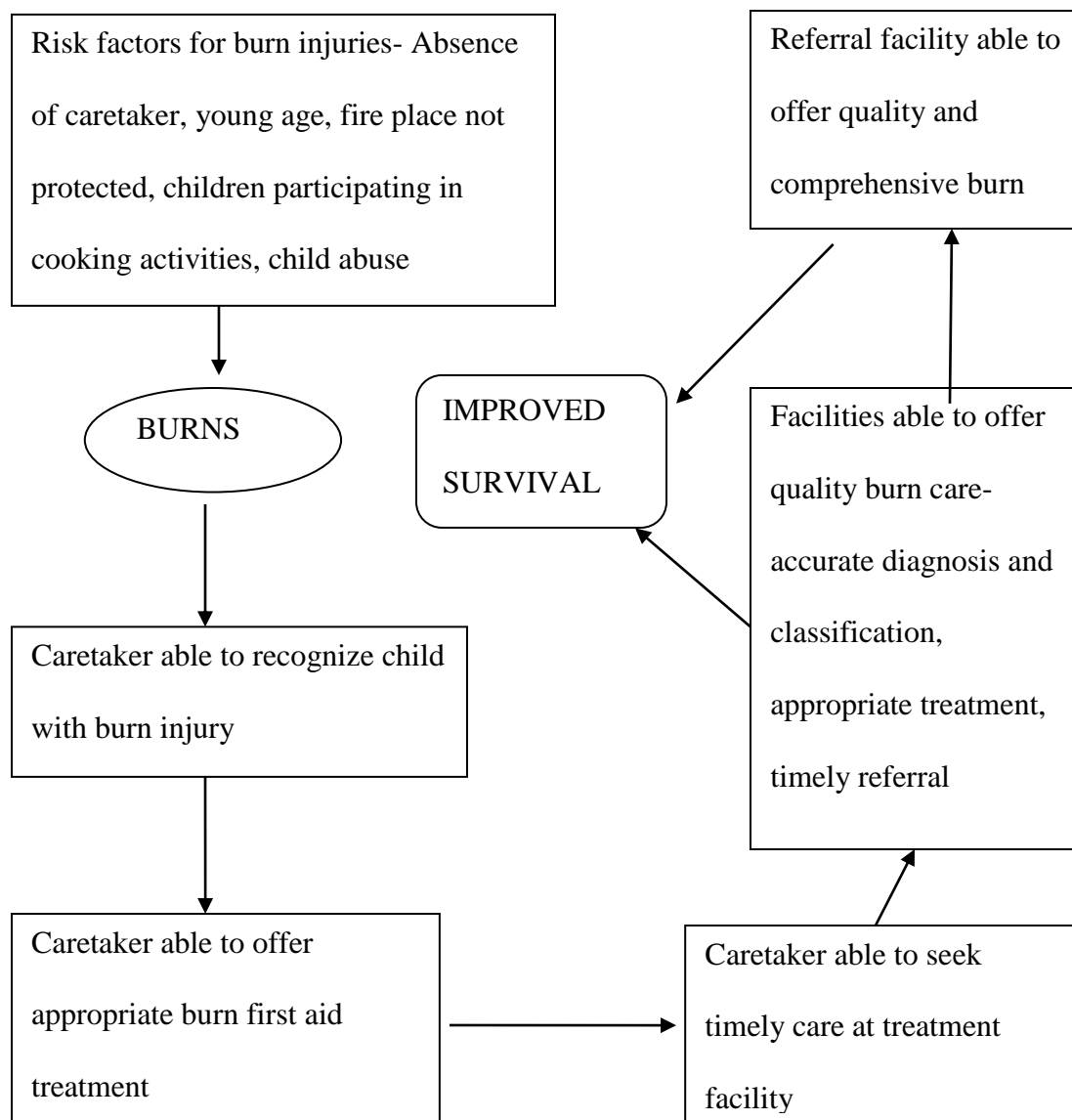
mortality rates reported have ranged from 12% (Oduor, 2010) to zero mortality (Mutiso et al. 2014).

Effective management of burns starts with adequate first aid at the site of injury. Cooling a burn lessens pain and decreases the burn depth hence speeding recovery and decreasing the risk of scarring. Cold water at temperature of 5°C to 25°C is most effective if started within three hours of injury. Recommended cooling time is 20 to 30 minutes (Skinner & Peat, 2002).

In New Zealand Skinner and Peat (2002) found that about 40.5% of burn injury patients received adequate first aid treatment (FAT). Another study in Australia revealed that only 22% of children with minor burn injuries received adequate FAT administered by their parents or caretakers (McCormack, Eric & Hugh, 2003). In Ghana Forjough (2006) found out that appropriate first aid treatment was used in 30% of children with burn injuries. In their study in Kenya Mutiso et al. (2014) revealed that first aid treatment was offered in only 23.4%. Majority of these (45%) were administered at a clinic prior to reaching the hospital while only 12% was by the parent or caretaker.

There are several factors that affect treatment of children with burns in sub-Saharan Africa. One of these is location (urban vs. rural, proximity to health facility), as families in the rural areas may turn to traditional methods of treatment before attempting to access a modern health professional (Hyder, Kayshap, Fishman & Wali, 2007). As a result effective treatment is low and case fatality is high. The cost of treatment may also be prohibitive resulting in only those with severe injuries presenting to the health care facilities (Forjough, 2006).

2.3 Theoretical Framework



Adapted from Kalter et al. Population Health Metrics 2011; 9: 45

CHAPTER 3 METHODOLOGY

3.1 Study area

The study was conducted at Webuye County Hospital, a level IV facility in Bungoma County, Kenya. The hospital serves as a referral facility for Bungoma and neighboring counties. It has a catchment population of 67000 people.

3.2 Study design

This was a descriptive study of children with burn injuries admitted at Webuye County Hospital during the study period.

3.3 Study population

Consisted of all children 12 years and below admitted at Webuye County hospital with burn injuries between April 2013 and March 2014.

3.4 Sampling methods

This was a census study over a one year fixed period. A census was chosen based on previous years' hospital data which showed that the number of children admitted with burn injuries was small. In this design the appropriate sampling technique was to include all children admitted with burn injuries who met the inclusion criteria.

3.5 Inclusion/exclusion criteria

3.5.1 Inclusion

- Aged 12 years and below
- Admitted to the ward with burn injuries during the study period
- Those whose parents/guardians gave consent to take part in the study

3.5.2 Exclusion

- Children injured before the start of the study period

3.6 Data collection procedure

Data was collected using a pilot-tested, coded questionnaire. The principal investigator collected all the data which included patients' demographics (age, sex and residence); risk factors for burn injury (whether child had a caretaker, participation of child in cooking, protected fireplace, separate kitchen and co morbid conditions that predispose to burn injury such as seizure disorders); circumstances of injury (time and place of injury, cause of the burn injury, associated injuries and pre-hospital care including first aid given); characteristic of burn wound (site, depth, percentage total body surface area (%TBSA) burnt estimated using a Lund and Browder chart, and clinical evidence of burn wound infection). Information about the hospital management and the outcome was extracted from the patients' files upon discharge. The primary outcome was the condition at discharge (alive or dead) and the

average length of hospital stay. The predictor variables were the age, extent of injury, cause of burn and timing of care.

3.7 Ethical consideration

The study was conducted after approval by the Moi University/ MTRH institutional Research and Ethics Committee (IREC) and Webuye County Hospital management. Written informed consent was sought from the parents/ guardians of the study subjects and permission was sought to have their phone contacts for follow up and possible home visits. All collected data was handled with confidentiality and no respondents' names were included in the data-collection tools.

3.8 Data Management and statistical Analysis

The completed questionnaires were coded and data entered in a database designed in SPSS (Statistical package for social sciences) Version 17 software and analyzed. Means and standard deviation were used to summarize the continuous variables whereas the categorical variables were summarized in form of proportions and frequency tables. The research findings are presented using tables, pie charts and bar-graphs.

3.9 Study Limitations

1. The study did not evaluate quality of care offered at the hospital and it is thus not possible to make conclusions on how the care affected the outcome of management.

CHAPTER 4 RESULTS

A total of 60 patients between the ages 0-12 years participated in the study.

Patterns of burn injuries

Age, co-morbidity and gender distribution

The age range was 7 months to 11 years and the mean age was 3.4years. Of these, 51 (85%) were aged 5years and below while 31(51.7%) were females. There were 4 (6.7%) known to have epilepsy and the burn injuries were reported to have occurred during a fit in all of them.

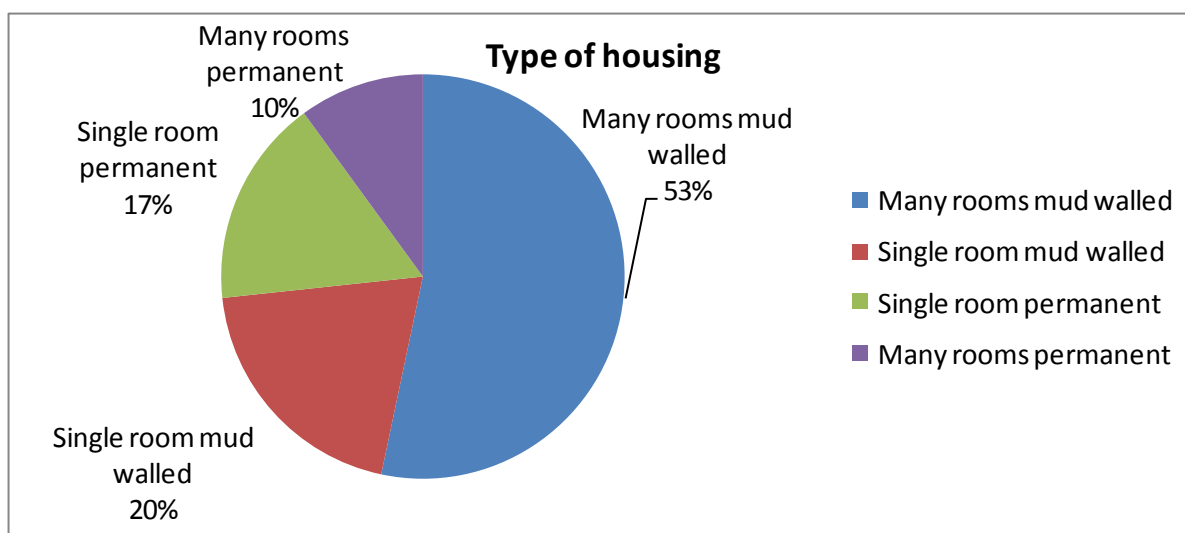
Table 4.1: Age distribution according to gender

Gender	Age group (%)		
	<1year	1-5years	6-12years
Male	3 (10.3%)	23 (79.4%)	3 (10.3%)
Female	2 (6.5%)	23 (74.2%)	6 (19.3%)

Environment and fuel data

Most of the respondents, 44(73.3%), lived in mud-walled houses while only 16(27%) lived in permanent houses (Figure 4.1). The median number of occupants (IQR) in the households was 5(4, 7). The kitchen was separate from the living room in 34(56.7%), while 23(38.3%) children were reported to participate in cooking activities at home. In 7(11.7%) households the fire place was protected by raising it beyond the reach of crawling children. Firewood was the main source of fuel for cooking in 46(77%) homes. In these households the fireplace consisted of three stones put on the floor.

Figure 4.1: Type of family residential units

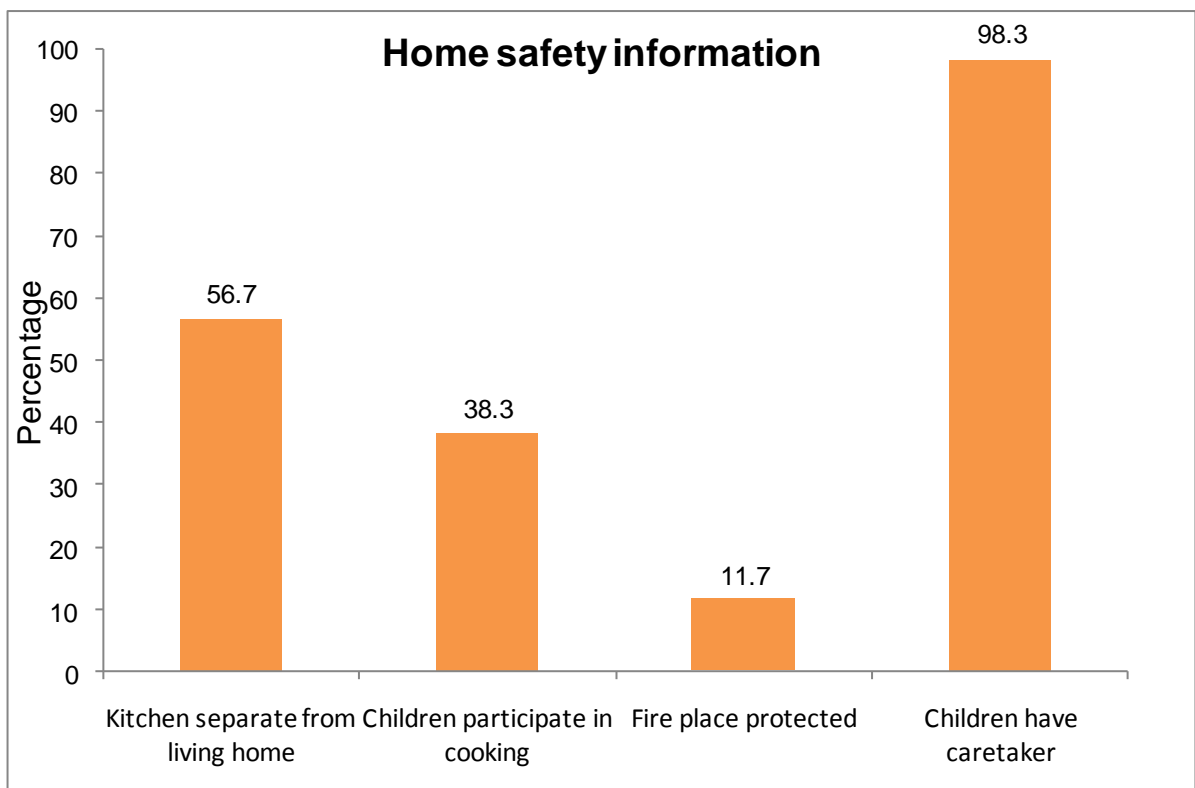


Care and supervision of children

There were 59(98.3%) children who were reported to have a caretaker, (figure 4.2 below).

However, in 30 (50.8%) cases the children were not being supervised at the time of injury.

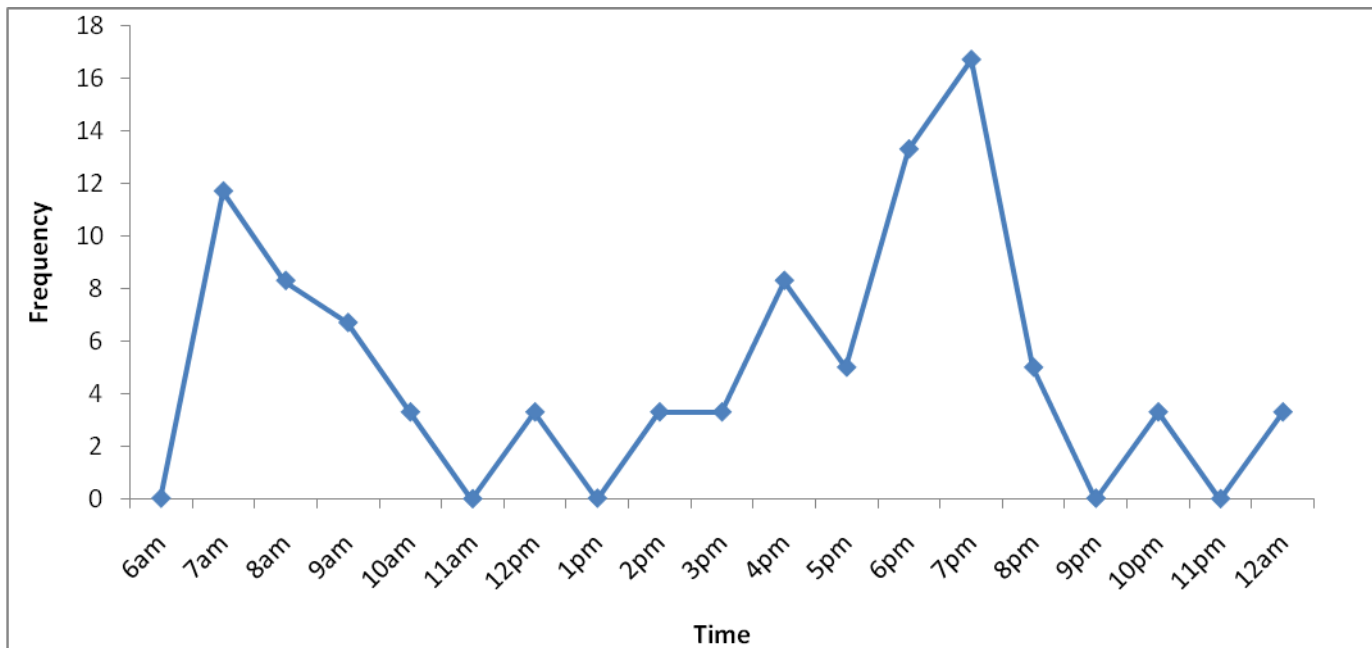
Figure 4.2: Home safety information



Timing of injury

Most of the injuries occurred in the morning and evening (Figure 4.3) and all the injuries were reportedly accidental.

Figure 4.3: Time of burn injury



Type of burn injury

Scalds with hot fluids accounted for 45 (75%) of these burns mostly hot water, milk tea or porridge. There were 14 (23%) burns due to open fire (flame) while one case of chemical burns was caused by acid spillage.

Distribution of burn injuries

The trunk was the most commonly affected body region in 34(56.7%) cases, followed by the upper limbs and the lower limbs in 12(20%) and 6(10%) respectively. In 16(26.7%) participants multiple regions were involved while the perineum was injured in 5(8.3%). A total of 98.3% of burns were sustained in the home. Majority of the wounds, 43(71.7%), were superficial and only 1(1.7%) was deep (figure 4.6). The others were mixed in depth. The total body surface area (TBSA) burn range was 7-26% with a mean of 10%. Flame caused the most extensive burns compared to other etiological agents (Table 4.2).

Table 4.2: Relationship between cause of burn and severity of injury

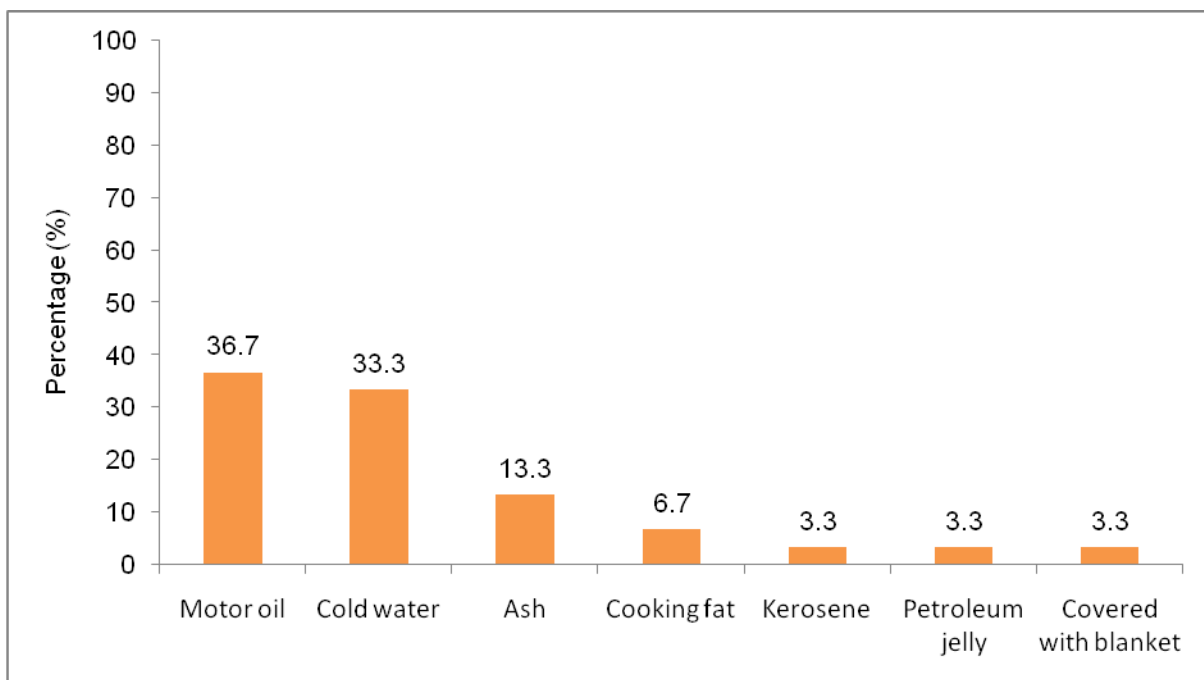
Cause of burn	Total Body Surface Area (TBSA)		
	<10%	10-19%	>20%
Hot liquid	19 (42.2%)	21 (46.7%)	5 (11.1%)
Flame	3 (21.4%)	5 (35.7%)	6 (42.9%)
Chemical	1 (100%)	0 (0.0%)	0 (0.0%)

Management of children with burn injuries

Pre-hospital management

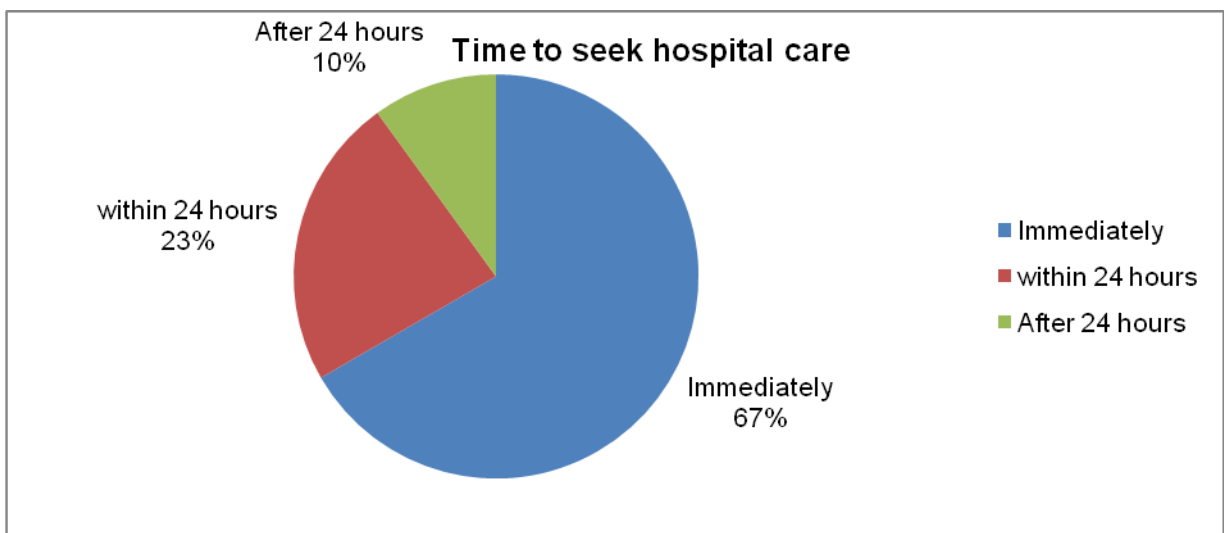
First aid was administered in only 30(50%) of the participants. However only 11 (n=60) applied cold water to the burn area (Figure 4.4). Of the cases that received first aid, most 28 (93.3%) was offered by the caretaker while the remainder had it administered in a clinic prior to arrival to the hospital. The majority of the children got to hospital using motorcycle (36 of 60, 60%) while 19 (31.7%) used public motor vehicle. The rest (5, 8.3%) walked to hospital.

Figure 4.4: Type of first aid administered at home



Majority of the children (54, 90%) were brought to hospital within 24 hours from the time of injury (Figure 4.5). However, all the six who delayed in seeking care had clinical evidence of burn wound infection at presentation to the hospital. They attributed this delay to financial constraints while some caretakers had regarded the injury to be minor and only came to hospital when it appeared to be getting worse.

Figure 4.5: Time taken before seeking hospital care

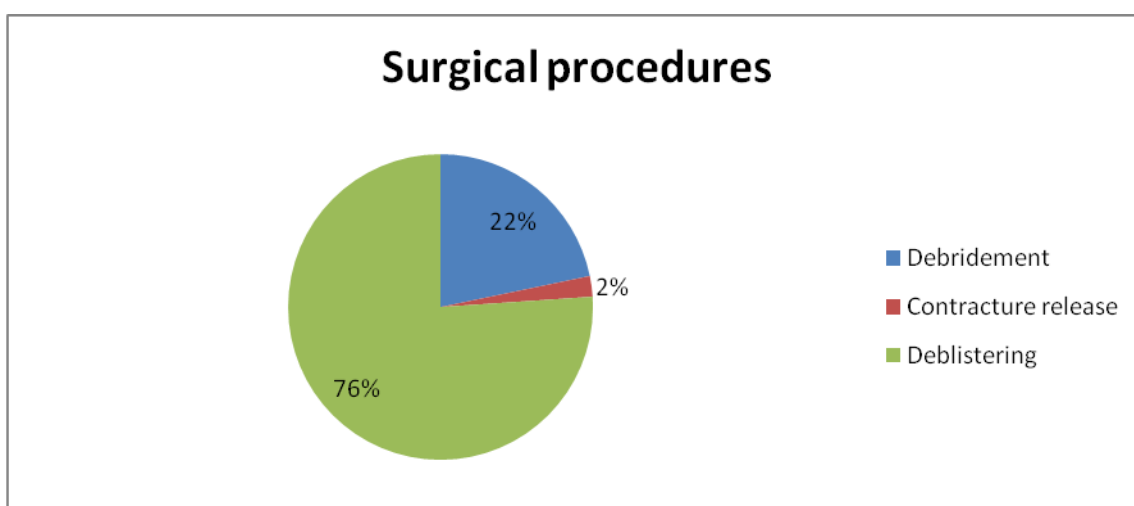


Hospital management

Conservative management with use of intravenous fluids, antibiotics, and analgesia and antimicrobial dressings were used in 50 (83.3%) participants. In 29 (58%) of these cases, patient treatment files showed that not all the prescribed treatment was administered.

However, we were unable to ascertain whether this was due to lack of documentation or non-adherence to protocol of care since our study did not purpose to address the quality of care at the hospital. A total of 10 patients (16.7%) underwent surgical debridement in the operating room under general anesthesia (Figure 4.6). One case presented with recurrent burns and had developed contractures from the previous injury. This patient underwent contracture release in the operating theatre. Three children were transfused. In one case however, the patient file was not clear on the reason for transfusion as records of the estimated hemoglobin level or assessment of severe anemia were lacking.

Figure 4.6: Surgical procedures done



Outcomes of burn injuries

Majority of the participants (57, 95%) survived the injuries (Figure 4.7). Among the three who died (5%), sepsis was documented as the cause of death in two cases while the other one was reported to have died due to severe anemia.

Children who sustained injuries from flame burns had a relatively higher mortality compared to other causes (Table 4.3). All the children who died had severe burns (%TBSA greater than 20) and they were all aged below 5 years (Tables 4.4 and 4.5). The main short term complication was scarring which occurred in 36 (60%) of the participants.

Table 4.3: Relationship between cause of burn and outcome of treatment

Cause of burn	Outcome of treatment (N=60)	
	Dead (%)	Alive (%)
Hot Liquid	1 (1.7%)	44 (73.3%)
Flame	2 (3.3%)	12 (20.0%)
Chemical	0 (0.0%)	1 (1.7%)
Total	3 (5%)	57 (97%)

Table 4.4: Relationship between the extent of burn and outcome

Percentage Burn	Outcome of treatment (N=60)	
	Dead (%)	Alive (%)
<10%	0 (0.0%)	23 (38.3%)
10-19%	0 (0.0%)	26 (43.3%)
>20%	3 (5.0%)	8 (13.3%)
Total	3 (5%)	57 (95%)

Table 4.5: Relationship between age and mortality

Age group	Outcome of treatment	
	Dead (%)	Alive (%)
Less than 1 year	1(1.7%)	4(6.7%)
1-5 years	2(3.3%)	44(73.3%)
6-12 years	0(0.0%)	9(15%)
Total	3(5.0%)	57(95%)

The average length of hospital stay was 11.6 ± 4 days. Children who sustained flame injuries and those who were brought to care later than 24 hours from the time of injury had relatively longer durations of hospital stay compared to the rest (Table 4.6)

Table 4.6: Average length of stay

Factor	Average length of stay (days)	Length of Stay (Mean Rank)
Age group (years)		
<1	12.0	37.10
1-5	11.0	31.01
6-12	10.0	24.22
Extent of injury (%TBSA)		
<10	10.0	25.67
10-19	12.5	33.69
>20	10.0	23.31
Cause of burn injury		

Hot liquid	11.0	29.31
Flame	16.0	34.79
Chemical	10.0	24.00
Timing of care		
<24 hours	11.0	30.60
>24 hours	17.5	30.05

CHAPTER 5 DISCUSSION

This study gives information on the epidemiological patterns of children admitted with burn injuries at Webuye County Hospital. Burns are a major cause of unintentional injuries in children particularly in the developing countries. Along with causing mortality, the injuries impact on the quality of life in terms of negative cosmetic and psychosocial effects hence making them a major public health concern.

Age, co-morbidity and gender

The results from our study show that burns predominantly affect children below 5 years and within their home environments. Children aged 1-5 years account for the majority. Similar findings have been shown by other studies done in Tanzania (Chalya et al. 2011) and Kenya (Mutiso et al. 2014; Oduor, 2010). A lack of awareness of potentially dangerous situations and substances amongst young children is a likely contributing cause. In our study girls were slightly more affected than boys and this is different from studies done in Tanzania and Kenya above and Nigeria (Umibese & Oludiran, 2009). Pre-existing seizure disorders put children at risk of injury. In this study the children who were epileptic were reported to have sustained the injuries during fits. This has also been reported by Albertyn et al. (2006) who found that epilepsy and non-compliance to anticonvulsant medication increased the risk of falling into open fires. Such children need special care in the family since they sustain the injuries during seizures (Poulos et al. 2009).

Home safety and timing of injury

The most common place of occurrence of burn injuries was in the home and majority occurred in the morning and evening (peaks at 7-9am and 6-8pm). This is similar to studies done in other centers in the developing countries (Mutto et al., 2011; Chalya et al., 2011 and Xin et al., 2006). In our study the home measures were found to be inadequate in protecting children thus exposing them to burn injuries. Lowell, Quinlan and Gottlieb, (2008) found that in many homes in Sub-Saharan Africa the dwelling space is used for both cooking and sleeping making children more vulnerable to burn injuries. This may indicate that a lower socioeconomic status reflects a lower standard of home safety. The peak time of injuries indicates that majority of injuries could have happened during meal preparation times.

Care and supervision of children

Inadequate supervision and suboptimal home safety measures as reflected by our results probably also had a negative effect. There were no intentional injuries reported in our study similar to what was found by Mutiso et al. (2014). Other studies have however shown the presence of this aspect. Chalya et al. (2011) found a prevalence of 2.9% intentional injuries among children with burns. In their study Nakito and Lett, (2010) reported that 16% of injuries were intentional. The relatively low incidence of intentional burns in our study may not be a true representation of the actual situation as child abuse is largely under reported due to fear of legal and social repercussions.

Type of burn injury and distribution of burns

Scald was the most common type of burn injury in our study. This agrees with other studies globally (Skinner & Peat, 2002; Roman et al. 2012; Mutiso et al. 2014 and Oduor, 2010).

Majority were due to hot water and hot tea and occurred during food preparation indicating a health and safety issue in cooking areas such as the kitchen and further giving emphasis to the need for improved supervision. They however accounted for a lesser proportion (75%) compared to studies by Mutiso et al. (2014) and Oduor, (2010) where they caused over 90% of the burns.

The trunk was the most commonly involved body region (57%) and this was consistent with findings by Temu et al., (2008) and Okoro et al., (2009). This has an influence on the outcome of burn care as it may result in functional or cosmetic impairment.

A large percentage of patients in our study had burns with TBSA less than 20%. This corresponded with the large percentage of patients who received only conservative management (83.3%). Minor surgical interventions (debridement) were undertaken in 10% while one case underwent contracture release. The results were similar to those found by Chalya et al., (2011) but contrasted one by Langer et al., (2006) where a larger percentage of patients underwent surgical procedures despite results showing a relatively similar pattern of TBSA involved.

Similar to the study by Oduor, (2010) the trunk was the most commonly involved body part followed by multiple sites and upper limbs. This shows that the mechanism of injury is likely

due to younger children and toddlers having a tendency to reach for objects placed on a higher surface resulting in spillage onto the face, trunk and upper limbs.

Management of children with burn injuries

Results indicate that only 11 (18.3%) of the children received appropriate first aid treatment. Varied incidences of appropriate use of first aid for burn patients have been reported in other studies. McCormack et al., (2003) reported appropriate burn first aid treatment (FAT) was offered in 80% of the cases of minor childhood burns in Sidney, Australia. In Ghana, FAT was offered appropriately in 30% of the cases (Forjuoh et al., 1996). Whenever done appropriately, first aid treatment (FAT) for burns reduces severity of the injury, shortening the length of hospitalization and improving outcome (Skinner et al., 2002). The discrepancy may be attributed to differences in public health awareness and knowledge about first aid procedures for burns from one country to another. The common practice of application of oil to the injury, as seen in our study, has been shown to be counter-productive by worsening the depth of the injuries (Razzak & Kellerman, 2002).

Late presentation is the norm for most clinical conditions in our environment and burn injury is no exception. One of the factors that impact on the treatment of childhood burn injuries in Sub-Saharan Africa is location. Families in the rural areas may turn to traditional healing methods before attempting to access a modern health care professional (Choppra, Kettle, Wilkinson and Stirling, 1997).

Another issue is poverty; the cost of treatment may be prohibitive, resulting in only those with very severe burns or complications (contractures, infections) presenting for treatment (Forjuoh et al., 2006).

In our study six children (10%) were brought to hospital beyond 24 hours from injury time. This was attributed to long distance to the hospital and lack of money for transport and paying for treatment while others reportedly thought the injury was minor and did not need immediate treatment. All cases of burn wound infection at admission had presented late to hospital.

Outcomes of burn injuries

The fatality rate of 5% in our study was low compared to that found in studies by Oduor, (2010) and Chalya et al., (2011) which were 11.9% and 11.7% respectively. In their study, Mutiso et al., (2014) reported no mortality. The difference could be due to the fact that the studies by Oduor and Chalya were conducted in large referral centers compared to our study site and were prone to receive severe and complicated cases. Variations in management practice between the centers could supposedly contribute although none of the studies addressed the question of quality of care.

All deaths in our study occurred in children below 5 years of age and they were reportedly caused by sepsis and severe anemia. This is similar to findings by Umibese and Oludiran, (2009) who noted that sepsis was the main cause of death in children with burn injuries.

Reasons cited for the higher mortality in children include an immature immune system and

higher fluid requirements which place them at risk for sepsis and hypovolemic shock after the burn injury. Muller et al., (2001) reported that even small burns could cause death in children. This emphasizes the fact that children with burns need very close monitoring and care.

The average length of stay in our study (11.6 ± 4 days) was shorter than that reported by Chalya et al. (2011) which was 22.12 ± 16.62 days. Children who sustained flame injuries and those who had delayed presentation to care had relatively longer durations of hospital stay. This was likely due to the fact that flame injuries were associated with more severe injuries and all the children who had delayed presentation had burn wound infection. The main short term complication was scarring which was similar to findings by Chalya, et al. (2011).

CHAPTER 6 CONCLUSIONS AND RECOMMENDATIONS

CONCLUSIONS

- Majority of childhood burn injuries at Webuye County Hospital are scalds and affect children below 5 years with female predominance.
- Most of the burn injuries occur at home with inadequate safety measures.
- Pre-hospital first aid interventions were found to be suboptimal and some were potentially harmful.
- Majority of the children survived the burn injuries at Webuye County Hospital despite patient records showing gaps in treatment.

RECOMMENDATIONS

1. A study to assess the quality of care given to children with burn injuries at Webuye County Hospital and whether it impacts the outcome.
2. There is need for health and safety education to parents and caregivers with an aim to improve safety of the home environment as well as the quality of child supervision.
3. There is need for public health enlightenment on appropriate pre-hospital care for children with burn injuries.
4. A follow up study to describe the long term outcomes and complications of children with burn injuries seen at Webuye County Hospital.

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APPENDIX 1 QUESTIONNAIRE

BURN INJURIES AMONG CHILDREN ADMITTED AT WEBUYE COUNTY HOSPITAL: PATTERNS AND MANAGEMENT OUTCOMES

1.0 Patient Information

1.0.1 Child ID- _____ 1.0.2 Age _____ (yrs) _____ (months)

1.0.3 Sex Male/ Female _

1.0.4 Residence

1.0.5 History of known medical condition-Yes/No_ (specify)

1.1 Home information

1.1.1 Type of housing-

- Temporary (mud-walled)
- Permanent (specify single/multiple rooms)

1.1.2 Number of occupants_____

1.1.3 Is the kitchen separate from the living room? _Yes/No_

1.1.4 Do children participate in cooking at home? _Yes/No_

1.1.5 Is the fire place protected? _Yes/No_

1.1.6 Does the child have a caretaker? __ Yes/ No__

1.1.7 Approximate distance from home to the hospital (km)-

1.2 Caretaker Information

1.2.1 Age-_____ (yrs)

1.2.2 Sex M/F _____

1.2.3 Marital Status _____

1.2.4 What is your highest level of education?

- Primary _
- Secondary _
- College/ University _
- None _

1.2.5 Are you the breadwinner in the family? Yes _/ No __

1.2.6 What is your relationship to the patient?

- Mother
- Father
- Aunt
- Uncle

- Grandfather
- Grandmother
- Other (Specify) _____

1.3 Circumstances of injury

1.3.1 Where did the burn injury occur? (State exact place e.g. kitchen etc)

1.3.2 When did the injury occur? (State exact date and time)

1.3.3 Was the caretaker present when the injury occurred?

1.3.7 Did you administer any first aid to the child? __Yes/No__

1.3.9 If yes, in 1.3.7 above, what kind of aid (describe) _____

1.3.10 How did you transport the injured child to the hospital?

- Walking _
- Bicycle _
- Motorcycle _
- Motor vehicle _
- Other (specify) _

1.4 Pattern of burn injury

1.4.1 What caused the burn injury?

- Hot liquid-
- Fire-
- Chemical-
- Electricity-
- Other (specify)_

1.4.2 Region of the body burnt-

1.4.3 What is the extent of the burn injury? (Indicate depth and estimated TBSA)

1.4.3 Is there evidence of burn wound infection? ____Yes/No_____(Check the wound and record the vital signs)

1.4.4 Duration of time before coming to hospital-

1.5 Management of patient

1.5.1 Does this child require intravenous fluids?

1.5.2 If yes, above, how much fluids were prescribed and administered? (Check treatment sheet and cardex to confirm)

1.5.3 Surgical procedures done (tick all applicable)

- Amputation
- Debridement
- Skin grafting
- Other (specify)

1.5.3 Subsequent management (specify whether patient put on antibiotics, effective analgesia, other surgical procedures etc.)

1.6 Management outcome

1.6.1 Condition of patient at discharge

- Completely recovered
- With complications (specify)
- Dead

1.6.2 Further management required

- Yes (specify) _____
- No _____

1.6.3 Length of hospital stay _____ (days)

APPENDIX 2 CONSENT

CONSENT SEEKING INFORMATION SHEET- PARTICIPANTS

Burn injuries among children admitted at Webuye County Hospital: Patterns and management outcomes

You are being requested to participate in this study, on behalf of the child, because he/she is eligible.

What is the purpose of this study?

Burns among children are a common form of unintentional injuries. The study intends to determine the causes and factors that led to the child sustaining burn injuries as well as the outcomes of treatment in this hospital

What happens in this study?

A structured questionnaire will be used to collect information needed and you shall be guided through it so that your responses will be documented as appropriate to the various parts. There is no risk or discomfort associated with the study. You will only respond to the questions.

What are the benefits to being in this study?

There is no individual benefit from the participation in the study but it is hoped that the results from this research will help highlight the possible factors that contributed to the injury and

ways to prevent the same in future. The study also hopes to make necessary recommendations on ways to improve outcomes among children with burns in this hospital.

Confidentiality

The data collected from the study will be used for the purpose of the study only. Your name or medical information will not be made public by the researcher.

Participation in the study

Taking part in this study is voluntary. You have a right to withdraw any time you feel so.

CONSENT:

I have read the above information / information has been explained to me and I have fully understood. I have had opportunity to ask questions, and all my questions have been answered to my satisfaction. I consent that my child be enrolled in to the study.

Signature.....

Date

Telephone number

APPENDIX 3 BURN SEVERITY CHART

LUND AND BROWDER CHARTS FOR ESTIMATING BURN SURFACE AREA

