

*Full Length Research Paper*

# **Epidemiology of burn injuries: A basis for prevention in a post-conflict, Gulu, northern Uganda: A cross-sectional descriptive study design**

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Burns are a common cause of accidental deaths and morbidity in children in the developing countries. Young children and the elderly are at greater risks and they suffer disproportionate mortality and morbidity. The commonest cause of burns in children in Gulu was due to hot water and porridge pulled over. This study was conducted to find out the epidemiology of burns in the post-conflict Gulu, Uganda. A cross-sectional study was conducted in the surgical ward of Gulu Hospital from January 2009 to December 2010. The socio-demographics, sites of injuries and causative agents were obtained and described from questionnaire on patients' records. Ethical approval was obtained from the administration of the Hospital. Burn patients ( $n=115$ ) were admitted for various types of burns, 64.3% were children and 4.4% for >50 years. The clinical type of burns and time of occurrence were significantly associated with the age of the patient ( $\chi^2 = 17.72$ , p-value = 0.041) and ( $\chi^2 = 38.09$ , p-value = 0.002) respectively. 21.6% patients were offered first aid that could lead to burn wound infections. Burns is a common public health problem among children of Gulu and although they were numerically few, they comprised a patients' group that often required considerable resources because of the need for repeated operations, hygienic precautions, treatment of infections and supportive care to patients and their families.

**Keywords:** Epidemiology of burns, Gulu hospital, cross-sectional study.

## **INTRODUCTION**

World-wide, burns are one of the most significant health problems that leads to prolonged hospitalization and hence increased expenses for patients, their families and society (Bowen-Jones, 1990; Hag, 1990). Of particular concern, children are disproportionately affected in our 3<sup>rd</sup> world environment where poverty, ignorance and disease also still high, thereby constitute a significant morbidity and mortality to the population (Bowen-Jones, 1990; Barret, 1999). In several studies that have been conducted in several countries, burns have been ranked as the second most common cause of accidental death

in children younger than 5 years and the most common cause of accidental death in homes (Schubert, 1990; Harmel, 1986; Ryan, 1992). On top of causing significant morbidity and mortality (Barret, 1999), they also have considerable physical, psychological and economic effects on the patients, their families and society (Soltani, 1998). Gulu is a region that is just recovering from the 20 year old civil war in which nearly 80% of the population were displaced into internally displaced peoples camps (IDPS) with congested grass thatched huts which could get set ablazed spontaneously in the scorching heat of the dry season. Several reports of arsonists torching buildings and wild bush fires catching up with people in destroyed homes have been reported lately (GDPU, 2008).

In a study conducted in Uganda recently, burns was

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found to be one of the most devastating household injuries and accounted for 11% of all childhood injuries (Nakitto, 2010). We therefore conducted this study to identify the socio-demographic characteristics of burn patients, to investigate the causes and severity of burns and to describe the associations of the problem in those patients admitted to the Gulu University teaching Hospital over a period of two years.

## METHODS

### Setting

This study was conducted in Gulu Regional Referral Hospital, Uganda from January 2009 to December 2010. It is also a University teaching hospital for medical students of Gulu University and it is located at the centre of Gulu Municipality which is a regional city in northern Uganda which is 343km north of the capital Kampala. Gulu is a place which is just recovering from the 20 year old civil war. It is strategically located and endowed with its transport terminals and pivoted role in the vast and profitable distribution of goods in the region. It is the regional center for northern Uganda and draws a largely rural population; many of whom were displaced into camps famously known as the internally displaced peoples camps (IDPS) for safety from the insurgency. According to the Revised Gulu District Development Plan 2009/2010, Gulu municipality has a population of 119,430 and composed of four sub counties. The hospital is a 350 bed and it is composed of several departments headed by a specialist. The Department of surgery is made of several subunits such as Accident and emergency (A+E) unit, the orthopedic units and the specialized clinics such as urology, Ear, Nose and throat, Ophthalmology, plastic and physiotherapy units. All burn admissions to the surgical ward occur through the A+E unit. Patients normally spent the 1<sup>st</sup> 24 hours in the A + E unit for resuscitation and stabilization care and later transferred to the surgical ward for further management. The study was conducted in these units where surgical management of burns took place until discharge.

### Design

We conducted a cross-sectional study in Gulu university teaching hospital in Northern Uganda. The sample size of 115 was calculated and found enough to identify the epidemiology of Burns in this hospital with a power of 80% at 95% confidence interval.

### Selection of study participants

The patients were selected consecutively from the A+E and to the surgical wards. There were 115 burn patients that met the inclusion criteria in the two years of the study. The patients, who consented, assented and met the criteria for burns admission in the Hospital, were included. The admission criteria for burns in Gulu Hospital included: Children with BSA of  $\geq 10\%$ , Adult with BSA  $\geq 15\%$ , burns of special areas such as the hands, joints, face, perineum, deep burns, electric burns, burns due to acids or alkalis, circumferential burns and deep burns were admitted without regards to BSA. Patients who did not consent or declined in the course of the study or where transferred from the hospital within 24 hours of admission were excluded from the study.

### Data collection

The total number of (n =115) out of a total burn admission of 130 in a period of two years were subjected to a questionnaire-interview to obtain the following data:

The questionnaires were administered at the A+E unit of the hospital and the patients followed up to the surgical ward until the patients were discharged from the hospital.

Registration data: age, sex, residence, month of occurrence of burns.

Circumstances of the injury: place and time, brief description of the event, agent and first aid measures.

Clinical assessment of the wound: site affected the total burnt surface area (BSA).

Chronological data: dates of admission and discharge.

Two trained research assistants, with the authors supervising, collected data by use of a well designed questionnaire and direct observation of the burns patients. The two trained research assistants (1 male and 1 female) were nurses working in A+E and the surgical ward with experience in burns management.

Dependent variable: The epidemiology of burns. This was specifically on what, when, what circumstance, how long was the hospital stay and what is the first aid given to the victims.

Independent variables: These were sex, age, address, month of occurrence, agent of burns, time of occurrence, site affected, total burn surface area (BSA).

### Analysis

SPSS statistical software package version 12.0 was used to analyze data. First, we carried out univariate analysis

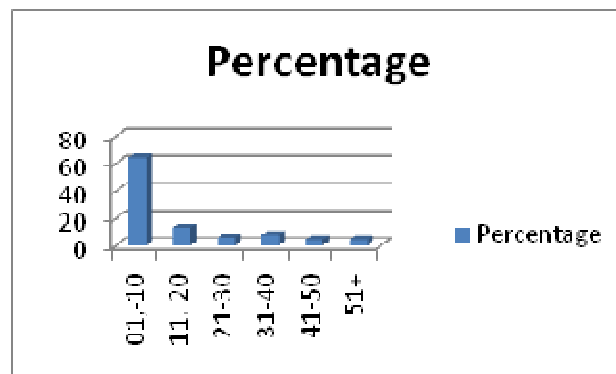


Figure 1: Graph showing occurrence of burns by age

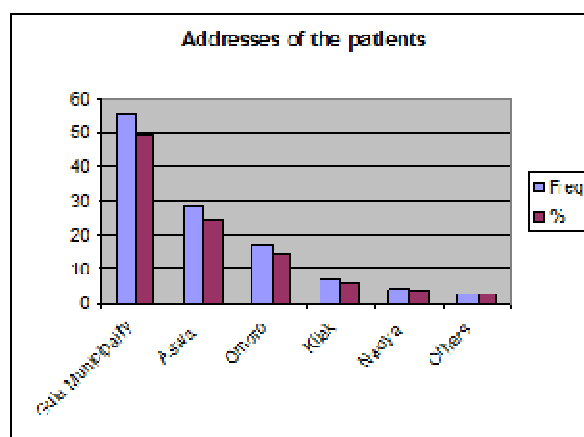


Figure 1: Graph showing the addresses of patients

to generate frequencies and proportions and secondly bivariate analysis to test for association between the independent and the outcome variables.

### Ethical consideration

The study was approved by the Research and ethics committee of Gulu Regional Referral Hospital. Informed consent was obtained from the patients or parents or guardians before questionnaire interview was administered.

### RESULTS

The socio demographic characteristics of the patients are shown on (Figure 1 and figure 2)

The majority of the patients were in the age range of 1-10 years constituting 64.3% and the least being those in the age group of >50 years (4.4%) (Figure 3).

### Patients' Gender

Fifty three percent were females and 47% males. The ratio of female to male was 1.1: 1

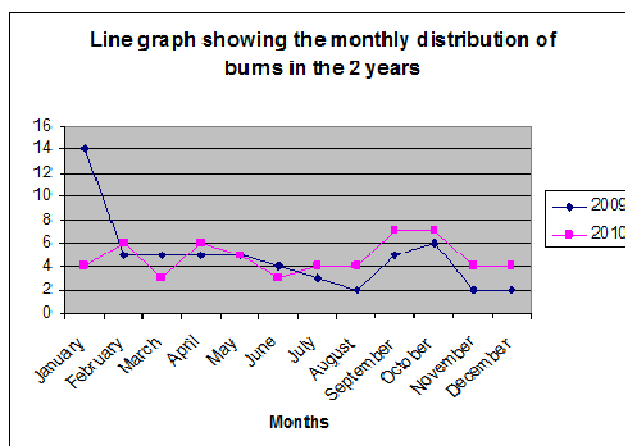
The majority of the patients (48.7%) were from Gulu Municipality, and the least numbers were from the two neighboring districts (2.6%).

For the year 2009, the highest number admitted was in January with 14 cases and the least was in August, September and October with 2 cases each. For the year 2010, the highest admission was in the months of September and October (7 cases each), and the least numbers recorded in March and June with 3 cases each month.

*Causative agents for burns:* The majority of burns were caused by hot water (65%), Open flames (25%) and hot porridge (10%) in the descending order.

*The sites of the burns:* The majority of the burns were in the upper limbs (45%) lower limbs (35%), Trunk (15%) and head and neck (5%)

*The total surface area burnt* (see table 1): The



**Figure 3:** Graph showing the monthly distribution of burns

**Table1:** Shows the time of occurrence of burns, the duration of Hospital stay, clinical type of the burns, burns of special areas and the burns surface area

**The time of the burns**

Time of occurrence	Frequency	Percentage
7:00am to 12:00pm	70	60.9
12:01pm to 5:00pm	20	17.4
5:01pm to 8:00pm	15	13
8:01pm to Midnight	10	8.7

**The duration of the Hospital stay**

**Duration**

>1 day	5	4.3
2 - 3 days	10	8.7
3 - 5 days	5	4.3
1 week	40	34.8
2 weeks	30	26.1
3 weeks	20	17.4
> 3 weeks	5	4.3

**Clinical type of burns**

Deep	20	17.4
Superficial	80	69.6
Both	15	13

**Burns of special areas**

**Special areas**

Perineum	4	16
Hands	10	40
Face	4	16
Joints	4	16
Airways	3	12

**The Body surface area of burns**

**BSA**

<10%	25	22
10'-14%	50	44
15-19%	25	22
20-24%	15	13

**Table 2 (a):** Chi square result for association between age groups and types of burn

Variables Age group	Types of Burn		
	Deep	Superficial	Both deep and superficial
1.0-10	18	43	13
11.0 – 20	0	15	0
21 – 30	1	6	0
31 – 40	0	9	0
41 – 50	1	3	1
51+	0	4	1
Chi square ( $\chi^2$ ) = 17.72			
p-value = 0.041			

There is a significant association between age groups and types of burns ( $\chi^2 = 17.72$ , p-value = 0.041)

classification of the burnt body surface area (BSA) were as follows: BSA <10% (21.7%), 10-14% (43.5%), 15-19% (21.7%) and 20-24 (13.0%). The majority of the patients sustained injuries within 10-14% of the total body surface area.

*For burns of special areas (see table 1):* The majority were the burns of the hands (40%), Perineum (16%), Face (16%), Joints (16%), and airway (12%). The majority of the burns of special areas were in the hands and there were no significant associations.

*The clinical types of burns sustained by the patients (see table 1):* Deep burns were observed in 17.4%, the majority were superficial burns which constituted 69.6% while both clinical types occurred in 13.0%. There is a significant association between age groups and types of burns ( $\chi^2 = 17.72$ , p-value = 0.041). This means children often sustained more severe burns than adults.

*The time of the day when burns occurred (see table 1):* The majority of the burns occurred between 7:00am to 12:00pm (60.9%); 12:01pm to 5:00pm (17.4%), 5:01pm to 8:00pm (13.0%), and 8:01pm to midnight (8.7%). Also, there was a significant association between age groups and time of burn ( $\chi^2 = 38.09$ , p-value = 0.002).

*The duration of Hospital stay (see table 1):* The majority of the patients spent 1 week in the hospital (34.8%), > 1day (4.3%), 2-3 days (8.7%), 3-5 days (4.3%), 2 weeks (26.1%), 3 weeks (17.4%), and > 3 weeks (4.3%)

*First Aid remedies:* The majority of remedies used were cold water (52.2%), Sugar crystals (26.2%), fur (8.7%), Cow dung (4.3%), Soil (4.3%) and Lotion (4.3%)

## DISCUSSION

### Socio-demographic Characteristics of respondents

There were 115 burn cases that fulfilled the inclusion criteria and admission criteria at Gulu university teaching hospital out of the total 130 cases of burn admission for

the 2 year study period. Figure 1 and Figure 2 show the socio-demographic characteristics of the patients with majority of the patient being those 10 years and below, females were the majority and most came from Gulu municipality. The modal age group of burnt patients was (1-10) years. Figure 1 shows that the majority of patients were in the age group of 1-10 years. This finding is similar to those that were seen in children in south eastern Nigeria (Okoro, 2009) where the incidence of burns among the patients was inversely related to their age. Okoro, (2009) suggested that, more burns occur in this age group due to adventurous nature of the children during the first decade of life which exposes them to burns more often than any other age groups. This he thought may not be unrelated to the fact that children between 1 and 2 years, particularly males, were very active and explorative, yet with minimum ability to recognize hazards. Hence, they are more prone to accidents generally. The low prevalence of burns in the elderly (>50 years) could be because most of them do not sustain burns that were severe enough to warrant admission in the hospital and therefore the majority of them were treated as out-patients. The ages had significant associations with the clinical types of the burns and the time of occurrence (Table 2a and 2b). This means that the younger age groups had more severe injuries compared to the adults and again most affected at in the morning hours of the day. This correlates well with previous studies conducted in other countries (Ashraf, 1997) developmental and behavioural patterns associated with age, coupled with inadequate supervision of the children and young were cited as possible reason for exposure to hazardous situations.

*Clinical types of injuries:* A large percentage of our patients had relatively mild injuries and there were few cases of inhalational injuries. Thus, only dressing, analgesics and antibiotics were required in many of them for a few days. Others required additional intravenous fluid replacement and none required blood transfusion.

**Table 2 (b):** Chi square result for association between age groups and time of burns

Variables Age groups	Times of burn			
	7AM – 12:00PM	12:01 – 5PM	5:01 – 8:00PM	8:01PM– 12:00AM
01-10	50	9	9	6
11 - 20	8	7	0	0
21 - 30	3	0	2	2
31 - 40	3	0	4	2
41 - 50	4	1	0	0
51+	2	3	0	0
Chi square ( $\chi^2$ ) = 38.09				
p-value = 0.002				

There is a significant association between age groups and time of the burns ( $\chi^2 = 38.09$ , p-value = 0.002)

**Gender:** More females (53%) were admitted due to burn injuries compared to males. This could be due to the demographic characteristics of Gulu District in which there are more females than males (51.5% and 48.5% respectively) (GDPU, 2008). Alternatively, the occupational roles of the females in the family activities exposed them to more burns often than males in this community. Such duties like ironing, making fire, boiling water and cooking food etcetera increase their risks of being burnt. Ashraf, (1997), reported similar finding in Alexandria Hospital in Egypt, Forjuoh (1995) in India, Abu (1984) in Jordan who also reported female preponderance to burns due to domestic activities. However findings from the industrialized countries were different, males generally had significantly higher risks (Duggan, 1995). He reported more incidences of industrial and recreational activities among males in those developed countries.

**Residence:** Gulu Municipality registered the largest number of burns admitted to the surgical ward. The majority of the patients sustained domestic burn injuries and most of them were a self-referral. Less than 10% of the patients were referred from the health centres. This could be due to the easy accessibility of the hospital which is situated at the center of the Gulu municipality. It is likely to be due to the fact that the municipality had the greater population than the rest of the counties in the district (GDPU, 2008). It might also be due to the fact that the other counties have their own health facilities that they normally use for the treatment of these cases.

**Monthly distribution of burns:** The trend for burns in our study does not give any monthly significance and agrees with other studies conducted else where in Africa (Ashraf, 1997). With regards to the monthly distribution of cases, the dry season was particularly expected to present with more cases of burns due to major wild bush fires during the dry season. January had more cases in 2009 but overall the pattern was uniform through out the 2 years.

No significant association was observed.

**Agents causing burns:** The prominence of hot water and hot porridge in the etiology of burns in this area is hereby reported. This finding is in agreement with other studies noted in parts of Nigeria (Adesunkanmi, 1994) and (Uba *et al*, 2007). This finding is, however, at variance with some reports in which flame burns assumed prominence over hot water (Kalayi, 2006) and (Dongo, 2007).

We note that these contrasting reports of studies, were conducted in a manner that adults and children were lumped together (Kamel, 1987), (El-Sonbaty, 1990), India (Malla, 1983) and Jordan (El-Muhtaseb, 1983). On the other hand, the picture of burns reported from industrialized countries differed, where flammable liquids and gas stoves were the most common source of burns (Jay, 1977; Pegg, 1983). Burn agents in individualized countries, largely depends on the standard of living and lifestyles (Jay, 1977; Pegg, 1983).

Of special importance, note that we never encountered burns from electricity, lightening and chemicals.

With regards to the severity of the burns, most of them were superficial burns which required only a few days of admission before the patients could be discharged from the hospital to attend surgical out patients' services.

**The sites of the wounds:** The limbs and the trunk were the most commonly affected parts. This finding is comparable to other studies conducted else where in Africa (Ashraf, 1997; Okoro, 2009; Adesunkanmi, 1994).

**Time of the occurrence:** Most burns occurred in the morning (between seven and midday). These are mainly hours when adults were out of their homes and children were left unattended to or children were being kept by House maids. The age of the burnt patient was significantly associated with the time of the occurrence ( $\chi^2 = 38.09$ , p = 0.002).

Of special interest to note is that the first Aid remedies

offered to the patients, 21.6% of cases were treated with substances that would increase the risk of infecting in burn wounds. A study of the outcomes of the burns with relation to these risk factors could be the next study area in this region and we considered it part of the limitation of our study.

## CONCLUSION

Burns is an important public health problem in Gulu especially in children 10 years and below where the prevalence was highest and associated with the severity of clinical types and time of the burns. The need to study further the use of inappropriate first aid materials in burns in relations to short term outcomes would be highly required to inform the policy makers in the district on the outcome and thus develop a possible public health intervention in the community.

## RECOMMENDATION

Health workers should intensify sensitization and health education of communities on measures to prevent burns especially in children. A multi-sectoral approach in the management, prevention and control of burns should be adopted in this region.

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