

Epidemiology of burn injuries in Mekele Town, Northern Ethiopia: A community based study

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Abstract

Introduction: Epidemiological study on burn injuries and exploration of the risk factors in different settings is important for effective intervention. Very little is known about burn injuries in Ethiopia.

Objectives: The aims of this study were to assess the annual incidence of burn injuries and to describe the local knowledge about burns in Mekele town in Tigray, Ethiopia.

Methodology: We did a cross sectional survey of burn injuries on 7309 individuals in 1390 households.

Results: The annual incidence in burns was 1.2%. Burn had the highest incidence among children less than 5 years old (4.8%). Scald (59%) was the leading cause of burn followed by flame (34%). Most burns occurred at home (81%). Eighty nine point four percent of the burns healed with minor or no sequelae, 9.4% developed sequelae and the mortality was 1%. Crowding and employment were significant risk factors for burn injury. Domestic burn injuries were common among women of reproductive age and work related burns were more common among men. Many people (36%) used harmful substances with deleterious consequences as first aid measure for burn.

Discussion: This is the first study from northern Ethiopia and underlines that burn represents a major public health problem. However as we have used a long recall period people may have forgotten minor injuries and we may have underestimated the true incidence. Many people either do not know or have harmful misconceptions about first aid measures for burn injuries. Thus we recommend health education about burn prevention and first aid measures be given to the public. [*Ethiop. J. Health Dev.* 2002;16(1):1-7]

Introduction

Burn injury is a major component of unintentional injuries worldwide (1). It is the leading cause of deaths from injury in some countries. In Egypt, 9% of deaths among married women were due to burns (2). In India, more than 10,000 burn-associated deaths and over one million moderate to severe burns occur each year (3). In a hospital in Zimbabwe, burns comprised 8% of trauma admissions (4).

A combined hospital and community based survey of burn injuries in rural southern Ethiopia estimated the lifetime incidence of burns among women of reproductive age to be 11% (5). Two retrospective analyses of paediatric inpatients showed that burns accounted for 0.8% (6) and 1.7% (7) of all paediatric admissions. Burns were the third commonest unintentional injuries among children, next to firearms and falls and the second leading causes of death (7).

Epidemiological studies that determine the magnitude and risk factors are prerequisite for planning preventive measures and burn care facilities (8,9). Very little is known about the epidemiology of burn injuries in Ethiopia. No study was done on burn injuries in Tigray, the northern region in Ethiopia.

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The aims of this study were to assess the annual incidence of burn injuries and to describe the local knowledge about burns and describe the most common first aid measures used by the population.

Materials and Methods

Study area and population: The study was conducted in Mekele, the capital of Tigray in Ethiopia. Ninety six thousand nine hundred thirty eight people organised in 20 urban dwellers' association live in this town (10). In Mekele the average family size was four and the average number of persons per room was three (10). There is one regional referral hospital for the 3.2 million population of the region (10).

Design: We did a cross sectional survey to assess the incidence of burn injuries and associated risk factors. We used a recall period of 12 months (March 1, 1998 to February 28, 1999). We defined burns as injuries larger than 2cm by 2cm or lesions that formed blisters.

The heads of households were interviewed. We obtained information about age and gender of study population. We also inquired about family size, income, literacy, and employment of heads of household, number of rooms in the house and methods of cooking. Additionally, the participants were asked about their knowledge about burn injuries and first aid measures. For each burn case we asked about the aetiology, place and month of injury, place of initial as well as final treatment and the outcome.

We pre-tested the questionnaire and enumerators conducted the interview. All enumerators were college students and were trained by the investigator. At the end of the training all were able to correctly translate the questionnaire in to the local language (Tigrigna). All households included in the sample participated in the study; there were no refusals. At the end of each working day, the investigator and the enumerators evaluated the data collecting process.

Sampling: The sample size was calculated using the Epi Info programme version 6.0. Based on the results of a previous study (5) from Ethiopia we designed the study to detect an incidence of 8% (95% CI 7, 9). We used a design effect of 2 and the calculated sample was 5638. In our study, however, we included 7309 people in 1390 households, 30% larger than the planned sample size. This resulted in a study population slightly more crowded than the general population (5 v.s 4 persons/ household). The male to female ratio was 1:1.3. People over 60 years old were under represented in comparison to all other age groups (3.2 v/s 7.5%, Table 1). This discrepancy between the planned and studied sample might be due to an error in the census, which was carried out four years earlier.

Table 1: Age and sex distribution of the study and sample populations

Age	Male			Female			Total		
	Study pop.	Sample	%	Study pop.	Sample	%	Study pop.	Sample	%
0-4	5,772	384	6.6	5,688	362	6.4	11,460	746	6.5
5-9	6,653	475	7.0	6,580	493	7.5	13,233	968	7.3
10-14	7,595	581	7.6	7,862	611	7.8	15,457	1192	7.7
15-59	18,295	1655	8.7	27,634	2373	8.6	45,9292	4028	8.7
60+	4,541	191	3.2	6,318	204	3.2	10,859	395	3.2
Total	45,729	3274	7.0	51,209	4035	7.8	96,938	7,209	7.5

% - Sample as percent of the study population with in he age group

An existing household numbering system from the town's municipality was used to make a systematic, random sample. Thus we selected every fifteenth household. All 20 urban dwellers' associations in Mekele town were proportionately represented.

Data analysis and statistical evaluation: We analysed data using SPSS version 8.0 and Epi Info version 6.0. Results are reported as incidence, odds ratio and Chi-square with 95% confidence intervals. P-values less than 0.05 were regarded as statistically significant. Logistic regression was used to analyse risk factors.

Ethical Issues: Ethical clearance was obtained from the Centre for International Health and the Ethical committee of the Tigray regional Health Bureau. Participants were informed about the benefits and objectives of the study. Verbal consent was obtained from each head of household before proceeding with the inter-views.

Results

Incidence: The annual incidence of burn injuries was 1.2% (8/7309). Children less than five years old had the highest incidence 4.8% (36/710) among which 17 (48%) were boys and 19 (52%) were girls. All the burn injuries that occurred in the 10 to 14 year old children were seen among girls. There was no difference in the incidence of burn injuries between 15-59 old males (12/1655, 9.72%) and females (17/2373, 9.72%). However 14/16 domestic burn injuries (87.5%) and 9/11 (81.8%) work related burn injuries in this age group occurred among women and men respectively ($X^2=10.2$, $p=0.0008$). There was no age or sex preponderance in the injuries sustained during leisure time. Eighty three or ninety eight percent of the burns were accidental and 2 (2%) were intentional.

Scalds occurred in 50 (59%) patients and was the most common aetiology followed by flame 29 (34%). Contact and electrical injuries accounted for 3 (3.5%) each. Among children less than 10 years old the most common aetiology was scald and no contact or electrical burns were seen in this age group (Figure 1).

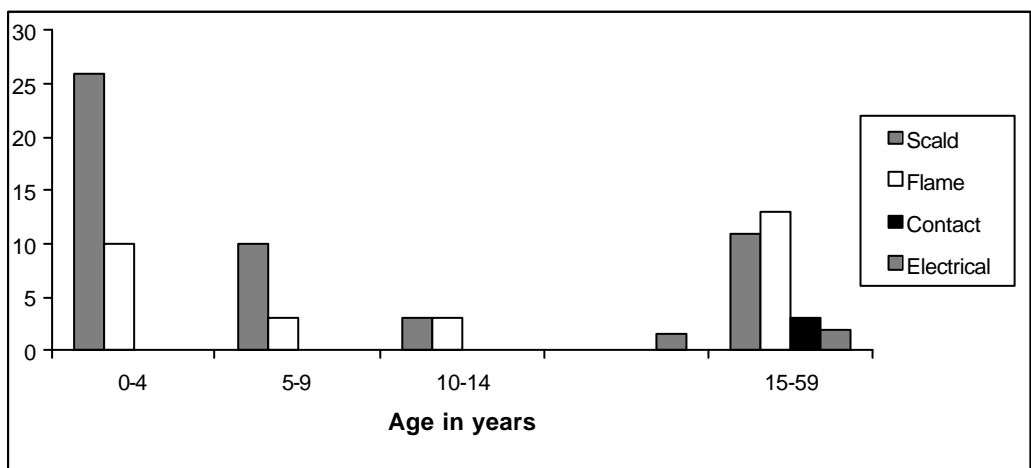


Figure 1: Aetiology of burns by age & sex

Table 2: Age specific burn incidence

Age	Study population	Burn injuries	Incidence in %	95% CI
0-4	746	36	4.82	3.45, 6.69
5-9	968	13	1.34	0.75, 2.35
10-14	1192	7	0.59	0.26, 1.26
15-59	4028	29	0.72	0.49, 1.05
60+	378	0	0.00	0.00, 1.26

Risk factors: The main risk factors associated with burn injuries are shown in Table 3. Most burns occurred at home 69 (81%), followed by accidents at work 10 (12%) and the rest 6 (7%) sustained burns at recreational places.

There was no significant seasonal variation in the incidence of burn injuries (6.5 per month in warm and 7.5 per month in the colder season (OR 1.15, 95% CI 0.82, 1.63). The colder season in Mekele is during the rainy months from June to October.

There was a higher incidence of burns in the families with employed heads of household (57/632) than none employed (28/673) households (Table 3). Twenty six out of 36 (72%) burn injuries among children less than 5 years old and 36 out of 49 (73%) among children less than 10 years old occurred in the employed families. For the 10-14 and 15-59 year age groups the proportions were 4/7 (57%) and 17/29 (58%) respectively.

Crowded households (≥ 4 persons/ household) had more burn injuries (74/953) than those with smaller family size (11/352) (Table 3).

Burn injuries were more common among the middle and high income (59/660) than in the low-income families (26/645) ($X^2=11.34$, $P=0.007$). The incidence of burn was higher among those with higher level of education (11/120) than among the illiterates (17/504) ($X^2=7.6$, $p=0.006$). We found that employment rate was 8% among the illiterate and 98% among those with higher education. The same was true for income strata, 25% in the low income, 79% in the middle and 65% in high income families were employed. There were no burn injuries associated with epilepsy, alcohol, drug abuse or disability in our study. Multiple sources of power were used for cooking and light in Mekele. Those were combinations of open fire, closed fire, kerosene stove and electrical stoves.

Care and outcome of burns

Initially 34 (40%) were treated at home and 51 (60%) were taken to the hospital. However, eventually 76 (89.4%) got their final treatment at Mekele hospital, 6 (7%) were treated by traditional healer(s) and 3 (4%) were cared for at home. Most of the burns, 76 (89.4%) healed with no or minor sequelae, 8 (9.4%) developed sequelae and one (1%) died in a house fire.

Knowledge and practice

The most common first aid measures given for burns represent harmful practices such as applying mud, urine and herbs; 501 (36%). Three hundred ninety six or twenty eight point five percent used vaseline and oil, 277 (20%) sought care at health institutions and 188 (13.5%) applied cold water when someone sustained burn injury.

Five hundred ninety eight or forty three percent did not know what to do for electrical injuries, 514 (37%) said they would take the person to hospital and 208 (15%) would break the electrical wire or switch off the circuit breaker. For lightning injuries 722 (52%)

Table 3: **risk factors for burn injury**

	Variable	Burn	No Burn	OR,
Age	0-4	36	710	8.58 (3.74, 22.96)
	5-9	13	955	2.30 (0.86, 6.40)
	10-14	7	1185	1.00
	15-59	29	3999	1.23 (0.51, 3.08)
	60+	0	378	0.00 (0.00, 2.47)
Sex	Male	35	3239	1.00
	Female	50	4085	1.3 (0.72, 1.79)
Income**	Low	26	645	1.00
	Middle	40	442	2.25 (1.31, 3.85)
	High	19	218	2.16 (1.12, 4.14)
Persons/room	≤4	11	352	1.00
	≥4	74	953	2.48 (1.26, 5.01)
Education	Illiterate	17	487	1.00
	Read & write	13	205	1.82 (0.82, 4.92)
	Elementary	33	320	2.95 (1.56, 5.63)
	Secondary	11	184	1.71 (0.74, 3.94)
	Higher education	11	109	2.89 (1.23, 6.74)
Means of cooking	Open fire (1)	0	15	0.00 (0.00, 109.20)
	Protected fire (2)	25	358	2.86 (0.44, 120.38)
	Kerosene stove (3)	1	3	13.67 (0.13, 1097.00)
	Electrical stove (4)	1	7	0.00 (0.00, 234.00)
Employment	Unemployed	28	673	1.00
	Employed	57	632	2.17 (1.33, 3.54)

** Income low = less than 150, middle = 150-500, High > 500 ETB per month

didn't know what to do, 472 (34%) said to bury the injured in the ground and 167 (12%) said they would take the patient to hospital.

Discussion

This is the first study from northern Ethiopia and underlines that burns represent a important public health problem. The incidence (1.2%) of burns in our study is less than the one estimated from a population based study in rural southern Ethiopia (5-11%) (5). However, as we have used a longer recall period people may have forgotten minor burn injuries and we may thus, have underestimated the true incidence.

In low-income countries like Ethiopia, health services may not be available to all sectors of the population. Additionally vital registration and health reports are incomplete (11). In such circumstances population based studies are more likely to reflect the true magnitude of burns than hospital based studies (8,9). Most urban areas in Ethiopia have similar socio-economic structure. We, therefore, believe that our results will highlight the problem of burn injuries in Ethiopia, particularly urban areas.

Some studies show that burns are generally common among the young, women of reproductive age and the very old (2-6). Traditionally in Ethiopia, women do all the cooking for the family and have higher incidence of domestic burns as seen in this study. Our findings agree with other studies from developing countries (2-6, 12-14). There were no burn injuries among people older than 60 years. As the information was collected from the head of the household minor injuries occurring among the elderly are likely to be forgotten than those occurring among children. Additionally this group of people was markedly under represented in our sample compared to the study population (Table 1).

Previous studies show that use of open fire for cooking particularly when placed at ground level, kerosene stoves and lanterns are major risk factors for burn injuries in developing countries (1,3,5,8,9). However this study could not definitely determine the most risky means of cooking, because people in Mekele used multiple sources of power for cooking and lighting. In addition we did not have enough sample size to show significant association as could be seen from Table 3.

Many studies show that burn incidence decreases with increasing literacy and economic status (1). This study, however, shows that burn incidence was less common among the illiterate than among the educated and lower among the low income than the high income families. This finding does not signify that poverty and ignorance protect from burn injuries. However this association might be because higher level of education might not be as important a factor as staying at home watching over children in protecting children from domestic burn injuries. The high incidence of burn injury in the employed households may be because parents had to leave their children unattended, with maids or older siblings when they go to work. Additionally the economic difference in the income categories we used may not bring about sufficient change in living condition to alter the incidence of burns. Therefore the higher employment rate in the literate and high-income families may have offset the benefits of literacy and relative high income.

Epilepsy, alcohol and drug abuse, mental illnesses and disability were not reported among the injured in this study. The prevalence of epilepsy as shown by one population study was 5.2/1000 making it the most common neurological condition in Ethiopia (15). Poor knowledge and traditional beliefs about the association between epilepsy and evil spirits might have led people not to report the illness. On the other hand since our sample was not large enough we might have missed epilepsy and other mental illnesses as risk factors for burns.

Only 13.5% mentioned use of cold water as a first aid measure and none recommended covering the burn wound with clean piece of cloth. More than one third of the population use urine, mud, herbs and other deleterious substances as first aid treatment. Appropriate health education should be given to abolish these harmful practices.

Playing and lack of parental care were the leading predisposing factors for burns in children. Keeping children out of the kitchen is a simple measure that could avert the injuries. However this is not possible in a one-room household with four or more people crammed in. Educating parents, particularly mothers to be aware of high-risk activities of children may reduce the incidence of burns in children.

When and if economic capacity allows, kindergarten or day care facilities for children may help reduce the incidence of burn injuries, particularly in employed families.

Studies show that changes in dressing styles in developed countries have reduced clothing ignition burns (1). Wearing closely fitting clothes may reduce clothing ignition burns. However due to cultural influences which determine how women dress in Ethiopia such change may not be foreseeable in the near future.

We believe this study has highlighted the problem of burn injuries in Ethiopia. However, we recommend further studies that determine the severity of burn injuries, the outcome, quality of care given at health institutions and methods to improve them.

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