

# The epidemiology of burns in rural Ethiopia

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## Abstract

**Study objective**—The aims were (1) to review inpatient burn records of Attat Hospital (Ethiopia) for the years 1983–1989, and (2) to determine the prevalence of burns and knowledge of first aid for burns in 16 communities served by Attat Hospital in rural Ethiopia

**Design**—A retrospective review of all records was used to describe characteristics of the inpatient with burns and cost of the service. Adult members of a systematic random sample (20%) of households from 16 communities (total population = 10 183) were interviewed. Questions focused on what to do to put out the fire, what to do for first aid for a burn, the major cause of adult and childhood burns, and a history of burn in any household member.

**Setting**—The study was conducted at Attat Hospital and in the surrounding Gurage-Chaha Region of West Shoa Province of Ethiopia.

**Study subjects**—There were 271 burn inpatients during the 7 year period from 1983–1989; 163 households were selected for interview; there were no refusals.

**Main results**—During the 7 year period the cost of tertiary inpatient burn treatment at Attat Hospital has been estimated to be US\$86 366.72, of which the hospital absorbed 66%. From community based information the cumulative incidence of burns in this population was found to be 5–11%. The absence of a cumulative increase in burns over time in men suggests that female respondents may not fully recall burn histories in adult male household members. The study population possess inadequate knowledge regarding burn prevention and burn first aid. Deleterious traditional compounds were used on 32% of burn patients in the villages.

**Conclusions**—Since most burns are related to household fires, generally in the domain of women in rural Ethiopia, women's groups may be the most appropriate setting for education on burn prevention and first aid. Burn prevention and first aid education should also be recognised as a priority in schools and in the training of community health workers.

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It has been suggested that burns are rapidly assuming greater importance as a cause of morbidity in developing countries.<sup>1</sup> The impact of

burns on communities in developing countries is substantial, due to the cost of treatment and rehabilitation, the loss of earnings, and the loss of working hours. Furthermore, the financial cost of burns to hospitals and health systems can be extensive, a result of prolonged hospital admission, the use of bandages and antibacterial lubricants, and in the case of superimposed pathogens, the need for systemic therapy. Patients can rarely afford these costs and governmental or non-governmental organisations must bear them. Although burn prevention is included among the WHO recommended primary health care topics,<sup>2</sup> burn prevention and first aid is often neglected in the training of community health workers.

While there are numerous reports of the frequency of burns in hospital based settings in developing countries<sup>1 3–12</sup> these reports only provide answers to a limited number of questions. There are no published population based surveys on the prevalence of burns and factors predisposing to burns in developing countries. It is impossible to compare the occurrence of burns among groups, among areas, and among subgroups with hospital based data.<sup>13</sup> Potential risk factors are many: age, gender, socioeconomic status, underlying disease conditions, hazardous home and fire designs and practices, all contribute to the occurrence of burns. Equally important, the population's knowledge of basic first aid will influence the outcome of burn injuries.

In order to improve burn prevention and first aid education programmes it is important to determine the primary disposing factors for burns and to understand the communities' perception of the causes and treatment of burns. We undertook a two part study which included a review of the Attat Hospital records to determine the characteristics of inpatients with burns and the cost of treatment, and a population based survey of burns and knowledge of burn prevention and first aid in communities surrounding Attat Hospital in rural Ethiopia. The study was undertaken to quantify the problem of burns in a rural setting and to identify factors in the population that may be amenable to preventive techniques.

## Methods

### STUDY AREA AND STUDY POPULATION

The study was conducted in the Gurage-Chaha Region of West Shoa Province 180 km southwest of Addis Ababa. The area has a tropical upland climate with an average altitude of 1700 metres. The culture is based on the cultivation of *Ensete edulis* or "false banana" plant. The standard of living is uniformly low. There are an estimated 330 people per square kilometre. Villages, on average,

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**Table I** Characteristics of inpatient burn population, Attat Hospital, 1983–1989

Age group (years)	Male (%)	Female (%)
0–9	79 (59)	52 (38)
10–19	21 (16)	25 (18)
20–29	14 (10)	27 (20)
30–39	6 (4)	15 (11)
40–49	5 (4)	10 (7)
50+	10 (7)	7 (5)
Total	135 (100)	136 (100)

$\chi^2$  difference between male and female inpatients by age = 16.1 (d.f. 5),  $p = 0.007$

contain 100 households. There is usually no separate room for the kitchen and cooking is carried out in the living quarters. The traditional fireplace is unprotected, on the floor in the middle of the room. Tertiary medical services are provided by a 57 bed mission hospital (Attat Hospital). In 1982 Attat hospital initiated community based health programmes in 16 surrounding communities which include the training of community health workers (supported by the community), establishment of women's health groups, construction of safe water systems, and early education programmes. Burn education is currently not included in the training. In 1989 Attat Hospital established a long term burn ward with six beds.

#### HOSPITAL RECORD REVIEW

All primary inpatient hospital burn admissions from 1983–1989 were reviewed to determine the age, sex, temporal characteristics, and cost-remittance differential of burn admissions. Subsequent admissions for correction of contractures were not included. The ICD codes of 940–949 were used to identify and define cases whose primary referral was for burns.

#### SURVEY OF BURNS AND BURN KNOWLEDGE IN THE COMMUNITIES

Trained public health personnel conducted interviews of adult household respondents selected by systematic random sample to include 20% of households in the 16 communities served by Attat Hospital supervised and community supported health assistants. Interview questions included knowledge of what to do to put out the fire, what to do for first aid for a burn, the major cause of

childhood burns, and the major cause of adult burns. A history of burn in the household members was also elicited from the respondent. A burn was defined according to severity (must have caused blisters or worse) and size (must have been larger than the size of a chicken egg). The house was also inspected to determine if the family's fire was protected (rim around the cooking area), if the family owned a naphtha lantern, whether the lantern was located on a stable base, and whether the family had a charcoal burner (primarily used for coffee preparation). Residents reporting burns were asked what first aid was performed for the burn and whether treatment was given by a health worker or hospital staff.

## Results

### HOSPITAL RECORD REVIEW

There were 271 burns inpatients during the seven year period, 1983–1989, for a total of 7150 inpatient days. Demographic characteristics are presented in table I. The range of inpatient days was 1–414, with 116 patients (42.8%) staying less than 10 days and 66 patients (24.4%) staying over one month. There were no electrical burns, since this area has no electricity. For the years 1988–1989, epilepsy was reported by clinicians as a predisposing factor among 29% of the adult inpatient burns.

The inpatient cost of burns is estimated by the hospitals to be approximately 25 Ethiopian birr (US\$12.07) per day. One hundred and fifty six patients (57.6%) had financial resources sufficient to cover their hospital costs, 81 patients (29.9%) were unable to contribute at all to their costs, and the remainder paid partial expenses. Ability to pay was not associated with age or sex of the patient. Patients with long hospital stays were likely not to have had the financial resources to pay for their hospital stay, in contrast to patients with a shorter hospital stay (table II). Assuming a conservative estimate of 50% paid by those providing "partial payment", it is estimated that the hospital absorbed US\$56 849.54 (65.8%) of the total cost of treating burn patients for the seven year period (US\$86 366.72).

**Table II** Payment for hospital inpatient burn care Attat Hospital, Ethiopia, 1983–1989

	Payment received from patient or family			Total
	No payment	Partial payment <sup>a</sup>	Full payment	
No of patients (%)	81 (29.9)	34 (12.5)	156 (57.6)	271 (100.0)
Mean inpatient days	51.9	30.2	12.5	26.4
Total days (%)	4206 (58.8)	997 (13.9)	1947 (27.2)	7150 (100.0)
Total cost in US\$ (days × \$12.07)	50 832.64	12 033.79	23 500.29	86 366.72
Cost to hospital in US\$ (days × \$12.07)	50 832.64	6016.90	0.0	56 849.54

<sup>a</sup>Partial payment is defined as 50% payment of hospital expenses  
One way analysis of variance; F test for trend,  $p < 0.001$

**Table III** First aid for victims of burns. Response to "How do you put out the fire?"

	Population based survey (%)	History of burn patient (%)
Roll the person on the ground*	31 (19)	0
Cover the fire with cloth†	69 (42)	4 (10)
Put water on the burning area†	130 (80)	19 (46)
Put green leaves on the burning area†	56 (34)	1 (2)
Put dirt/soil on the burn	0	2 (5)
Put egg yolk on the burn†	3 (2)	12 (29)
Total <sup>a</sup>	163 (100)	41 (100)

<sup>a</sup>Respondents provided more than one answer to the question  
\*0.001 <  $p < 0.01$ ; † $p < 0.001$

#### SURVEY OF BURNS AND BURN KNOWLEDGE IN THE COMMUNITIES

There were 163 households selected for interview; respondents included 137 women and 26 men, with an average age of 42. There were no refusals. Census information from the 16 communities (total population = 10 183) showed that 13% of the population were under 6 years, 47% of the population were under 16 years, and 12% of the population were 50 years or over.

Most respondents reported that putting water on the burning area was the method of choice for putting out the fire (table III). Since water is not readily available at certain times, green leaves were also recommended to stop the burning process.

Almost two thirds of the respondents reported taking the burned person to the hospital or health clinic as a primary method of first aid (table IV). Butter or oil was suggested as treatment by 77 (47%), while only 12 of the respondents (7%) suggested putting a clean cloth on the burned area. Twenty five respondents (15.9%) suggested putting cow dung, dirt, salt, or traditional com-

Table IV First aid for burns. Response to "What to do for first aid for the burn?"

	Population based survey (%)	History of burn patient (%)
Take the person to hospital/health centre	105 (64)	23 (56)
Put cold water on the burn	38 (23)	5 (12)
Allow the burn to get fresh air	2 (<1)	2 (5)
Cover the burn with a clean cloth	12 (7)	3 (7)
Put butter or oil on the burn†	77 (47)	6 (15)
Other: Put egg yolk on the burn	63 (39)	11 (27)
Put milk on the burn	8 (5)	0
Other: Deleterious compounds*	25 (16)	13 (32)
Salt	4 (2)	
Cow dung	7 (4)	
Dirt/soil	11 (7)	
Traditional compounds	6 (4)	
Put nothing on the burn	0	3 (7)
Total <sup>a</sup>	163 (100)	41 (100)

<sup>a</sup>Respondents provided more than one possible answer

\*0.01 < p < 0.05; †p < 0.001

pounds on the burned area. Male respondents were slightly more likely (19.2%) than female respondents (14.6%) to suggest these forms of first aid. Older respondents were more likely to report application of these hazardous substances (table V).

For children the respondents reported that playing was the primary predicator for burns, followed by a composite of activities including sleeping, sitting by the fire for warmth, and being left alone next to the fire (table VI). The two most common causes of burns in adults reported by the respondents were epilepsy and cooking.

All homes were reported to have some barrier around the cooking fire, although it was generally inadequate to prevent children from rolling into the fire during sleep. Naphtha lanterns, present in

all homes, were not on a stable base in 132 homes (81%). Sixty eight homes (42%) had a charcoal burner in addition to wood fires for cooking and preparation of coffee.

One hundred and twenty nine respondents (79%) reported no history of burn by a family member. In nine households the respondent had been burned and in 23 households burns were reported in one or more other household members. In an additional two households burns were reported by both the respondent and other household members, giving a total of 41 reported burns (5%). Eleven of the 163 respondents (6.7%) gave a personal history of a burn, while only nine burns were reported in the remaining 200 adult household members (4.7%).

The lifetime cumulative incidence of burns can be generated from reported burns (table VII). While the reported cumulative incidence of burns in women is consistent with an expected increase in lifetime incidence of burns, the results from the male household members are not consistent with the expected pattern. In these rural communities about 11% of women will have had a burn at some time in their lives.

In 20 of the 41 cases (49%) the burn was considered severe enough to warrant a hospital visit, in a further three cases a health clinic visit was made. Only one case reported visiting a traditional healer and the remaining 15 cases did not seek medical attention.

Table V Use of dangerous items for burn first aid by age.

Age group (years)	Recommended <sup>a</sup>	Not recommended
<41	7 (8.9%)	71
41+	18 (21.2%)	67

<sup>a</sup>Dangerous items defined as cow dung, dirt/soil, traditional compounds or salt  
 $\chi^2 = 3.77$ ,  $p = 0.05$ , odds ratio for use of dangerous items by older respondents = 2.72 (95% confidence interval 0.99, 7.73)

Table VI Causes of child and adult burns reported by respondent

	Population based survey (%)	History of burn patient (%)
Causes of childhood burns		
Playing	127 (78%)	19 (59%)
Sleeping, sitting for warmth or left alone	46 (28%)	7 (22%)
Cooking	11 (7%)	3 (9%)
Bringing fire from another house	9 (6%)	2 (6%)
Looking for child's mother	6 (4%)	0
Lantern (naphtha)	5 (3%)	0
Unknown	0	1 (3%)
Total <sup>a</sup>	163 (100)	32 (100)
Causes of adult burns		
Epilepsy*	72 (44%)	0
Cooking/boiling water for coffee	72 (44%)	4 (44%)
House burn	43 (26%)	0
Lantern (naphtha)	19 (12%)	0
Sitting for warmth, sleeping	24 (15%)	3 (33%)
Bringing fire from another house	0	2 (22%)
Total <sup>a</sup>	163 (100)	9 (100)

<sup>a</sup>Respondents provided more than one answer to the question

\*0.01 < p < 0.05

Table VII Community wide prevalence of burns for 16 communities surrounding Attat Hospital, 1990

Age group (years)	Lifetime cumulative incidence (No/10 000)		
	Males	Females	Total
0-9	9/112 (804)	3/109 (275)	12/221 (543)
10-19	3/122 (246)	6/114 (526)	9/236 (381)
20-29	2/40 (500)	2/43 (465)	4/83 (482)
30-39	1/27 (370)	3/59 (508)	4/86 (465)
40-49	2/41 (488)	5/54 (926)	7/95 (737)
50+	0/56 (0)	5/43 (1163)	5/99 (505)
Total	17/398 (427)	24/422 (568)	41/820 (500)
Mean age at time of burn (SD)	5.6 (9.6)	13.1 (14.7)*	

\*Student's t test not significant

Discussion

HOSPITAL BASED RECORDS VERSUS POPULATION BASED RESULTS

A review of hospital records cannot produce widely generalised findings since they are carried out on patients whose characteristics may differ from the total population at risk. The large proportion of males in the youngest age group of hospital inpatients may reflect preferential attendance to Attat Hospital by boys rather than an excess of burns among male infants. The large proportion of females in the 21+ years age group probably reflects an excess of burns in women compared to men. Review of the cost of inpatient care highlights the financial burden of burn care on hospitals in developing countries. Since the catchment area of Attat Hospital (estimated to be between 500 000 and two million people) is large, intervention in the 16 communities is unlikely to lead to a reduction in the total number of inpatient burn patients, since other factors (eg, an improving transportation system and increased population growth) will probably offset any reduction of burn incidence through public health measures instituted by Attat's community assistance programme.

CAUSES OF BURNS IN THE COMMUNITIES

A review of the causes of burns in communities is important in order to develop appropriate public health measures. Infants are severely burned because the cooking area is on the floor and, while crawling or sleeping near the flame, their clothing is ignited. The source of burns for children is the same as for adults but prior to the burn the children have generally been playing, or occasionally bringing fire from neighbouring homes.

The accuracy of lifetime incidence of burns in this population is questionable. The higher incidence of burns in respondents compared to other adult household members may reflect the higher risk of burn by adult women in this population. It may also result from an underestimation of burns in other adult household members. Since many men are away from the household for long periods of time, women may not accurately recall burn histories of men. The absence of a steadily increasing incidence of burns with age in men suggests that recall bias is the most likely explanation for the differences between the burn histories of males and females.

The purpose of this study was not to compare the practices of respondents with regard to prevention and first aid with the attitudes and knowledge of this population on the topic. Nevertheless, the results indicate that adults are well aware of the predisposing activities of children prior to the time of burn (table VI). There is a discrepancy between the reported causes of burns in adult residents and the causes obtained from the histories in the communities (table VI). Burns resulting from epilepsy and house burning are likely to be few in number compared to the overall number of adult burns, although these burns are often very severe in nature and more likely to be recognised by the respondents.

Ignition of clothing is an especially important problem among girls and women because they are exposed to open flames daily while cooking and because they wear loose fitting easily ignited clothing. Respondents reported that the recent introduction of polyesters replacing woollen and cotton fabrics was also associated with burns among women. The nylon fabrics used more commonly by young women in Ethiopia tend to melt with heat and in the molten form give rise to very deep burns. In this subsistence culture, few burns occur outside the home. If rural electrification is introduced, electrical burns will become an added source of burns in the community.

#### BURN PREVENTION

In our population, as elsewhere,<sup>3</sup> the home is the commonest site of burning injuries and children are the commonest victims. The ultimate mediators of any burn prevention programme for children are the parents. Results of this survey indicate that the introduction of various preventive measures may help lessen the incidence of burns in the communities. Modification of behaviour and environment is not simple, and health workers and teachers should realise that considerable time is needed before educational messages are assimilated. Preventive measures suggested include: (1) raising fires off the ground with bricks or stones so that a physical barrier prevents inadvertent contact without complicating food preparation; (2) making naphtha lamps more stable; and (3) encouraging home safety health education for at risk groups, especially people with epilepsy. The latter should also be encouraged to continue routine anticonvulsive drug therapy.

In the developed world changing clothing styles and fabrics have led to a reduction in burns, primarily among women and girls. It is unlikely

that these are practical interventions in a developing country rural setting. Some materials can be made flame retardant through the application of chemicals during the manufacturing process but until the problem is recognised by both government and manufacturers, action is unlikely. Consequently, ignition sources may be easier to modify than clothing.

#### FIRST AID FOR BURNS

A large proportion of the survey respondents did not know that a clothing fire should be managed by bundling in a blanket to smother the flames or rolling on the ground. It is encouraging that residents know that they should use cold water to stop the burning process, although in less than half of the actual burn cases was this done (table III). Ethiopians use various traditional methods for burn care which are often not beneficial. In Ethiopia 32% of burn histories included the use of traditional compounds that were likely to have had a detrimental effect. Traditional methods of burn care often contribute to a delay in reaching the hospital. In Malawi 30% of burned children admitted to a central hospital presented when the burn was already more than a week old.<sup>11</sup>

The only local applications recommended are cold or cool water to stop the burning process (this also has a soothing effect), and covering the burned area with a clean cloth if one is available. In many rural developing country settings these are insufficient recommendations; traditional societies encourage some form of "treatment". Raw egg yolk, as a first aid measure, may be the least offensive of the traditional practices and may actually provide some benefit. Educational messages should not discourage its use. The application of all other substances to the burned area should be discouraged.

Burn prevention and first aid education should be recognised as a priority in schools, community health groups, and women's groups. Since most burns are related to household fires, generally in the domain of women in rural Ethiopia, women's groups may be the most appropriate setting to conduct burn prevention and first aid education.

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