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BURNS: THE EPIDEMIOLOGICAL PATTERN, RISK AND SAFETY AWARENESS AT KENYATTA NATIONAL HOSPITAL, NAIROBI

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ABSTRACT

Background: Many burns are preventable but there is no published local prospective data on the epidemiological pattern of burns that would form the basis of care and formulation of burn prevention strategies.

Objectives: To determine the epidemiological pattern of burns and assess the awareness of burn risk and preventive measures among patients admitted at Kenyatta National Hospital (KNH) with burns.

Design: Cross-sectional study.

Setting: Kenyatta National Hospital.

Patients: One hundred and nine consecutive burn patients admitted at Kenyatta National Hospital.

Results: The mean age was 14.4 years (median 7.0, range 0.2–66 years). Mean total body surface area burned (TBSA) was 22.3% (median 13.0, range 1–95%). Children under five years were 48.6% with more scalds compared to adults. Open flames burns, involvement of accelerants and assault were prominent among adults. Education level above primary school was associated with higher risk awareness compared with primary level education or below.

Conclusion: The pattern of burns noted resembles other reported series but the role of accelerants and assault appears enhanced in this study. Public education campaigns aimed at burns reduction could be tailored to the educational level of target population.

INTRODUCTION

Burns are a major medical, social and public health concern in our community accounting for significant morbidity and mortality when compared with other types of trauma. Local studies have shown burns to constitute at least 3% of all injuries seen in hospital (1) and 16 – 37% of all injuries in children (2, 3). Burns, like most accidents, can often be prevented. This, however, is only possible when there is a clear understanding of the circumstances that lead to the injury and appreciation that those circumstances can be changed by active intention. This study was done

to assess the epidemiological pattern among burn patients admitted at KNH and their awareness of the risk to burn injuries and potential methods of burns prevention with a view to enhancing hospital care of burn patients and promoting burn prevention efforts in our community.

MATERIALS AND METHODS

One hundred and nine consecutive consenting patients admitted to KNH through the accident and emergency department with burns were recruited. Patients admitted through the plastic surgery out-

patient clinic for burn contracture release or other rehabilitative procedures were excluded from the study as were all patients unwilling or otherwise unable to give informed consent. The study was approved by the hospital research and ethics committee.

Literature review was done by CD-ROM search of all existing records of burns epidemiology between 1984 and 2004. A search of all dissertations on burns was made at the University of Nairobi Department of Surgery library. No prospective local literature on burns epidemiology was found.

A questionnaire was administered at the bedside by the primary author to eligible consenting patients to collect relevant epidemiological data plus risk and

safety awareness. This included demographic information, details of when, where and how the injury had occurred. A physical examination was then done to assess the burn wounds for anatomical distribution, extent and depth with the aid of a Lund Brown chart. Data were analysed using Statistical Programme for Social Sciences (SPSS) version 11.5.

RESULTS

A total of 109 patients were included in the study, 61 males and 48 females. Most of the patients were from within Nairobi and its environs in central province (Table 1).

Table 1

Residence by province

| Province | Nairobi | Central | Eastern | Rift Valley | Nyanza | Western | Total |
|-----------------|---------|---------|---------|-------------|--------|---------|-------|
| No. of patients | 89 | 12 | 4 | 2 | 1 | 1 | 109 |
| (%) | 81.7 | 11.0 | 2.8 | 1.8 | 0.9 | 0.9 | 100 |

The age distribution was bimodal with peaks in the age groups 0-5 and 21-30 years. The range was 0.2-66 years with a mean of 14.4 years. Children five years and younger comprised 48.6% of the study group, most of them, 66%, being two years and below.

Table 2

Age distribution in years

| Age (years) | <5 | 6-10 | 11-20 | 21-30 | 31-40 | 41-50 | 51-60 | 61-70 |
|-----------------|----|------|-------|-------|-------|-------|-------|-------|
| No. of Patients | 53 | 4 | 9 | 28 | 11 | 0 | 3 | 1 |

Most of the burns occurred at home (80.7%). Others were at the work place (11.0%) and in other places (8.3%). The causes of burns were: scalds (50.9%), open flames (46.4%) and electrical burns (2.7%). There was no chemical or dry heat burn noted. Open flame burns were caused by paraffin stove explosions 12, being doused with paraffin 12, house fires 8, other accidents involving paraffin or petrol 4, self ignition 2 and other causes 12.

Table 3

Cause of burns

| Cause of burn | Scald | Open flame | Electrical | Total |
|-----------------|-------|------------|------------|-------|
| No. of patients | 56 | 50 | 3 | 109 |
| (%) | 51.3 | 45.9 | 2.7 | 100% |

The total burned surface area (TBSA) ranged from 1-95% with a mean of 22.3%.

Table 4*Distribution of TBSA*

| TBSA (%) | 0-10 | 11-20 | 21-30 | 31-40 | 41-50 | >50 | Totals |
|-----------------|------|-------|-------|-------|-------|------|--------|
| No. of patients | 49 | 26 | 7 | 4 | 10 | 13 | 109 |
| (%) | 45 | 23.9 | 6.4 | 3.7 | 9.2 | 11.9 | 100 |

The depth of burns sustained was second degree (55.7%), third degree (7.5%) and mixed second and third degree (36.8%).

A comparison between open flame burns and scalds showed the former to cause more severe injuries with greater TBSA and depth than scalds ($p < 0.001$). Open flame burns also involved older patients and more body regions than scalds (Table 5).

Table 5*Comparison of scalds and open flame injuries*

| Burn type | No. | Mean age (years) | M:F ratio | Mean TBSA (%) | 3 rd (*) degree | Mean No. of regions |
|------------|-----|------------------|-----------|---------------|----------------------------|---------------------|
| Scalds | 56 | 5.6 | 1.35:1 | 11.9 | 8 (14.3%) | 2.21 |
| Open flame | 50 | 23.8 | 1.01:1 | 35.3 | 37 (74%) | 3.4 |
| P- values | | <0.001 | 0.56 | <0.001 | <0.001 | 0.002 |

* Patients with third degree burns

+/- associated second-degree burns

Known factors predisposing to injury were illnesses, alcohol and storage of flammable materials in the house (Table 6). The most frequently stored flammable material was paraffin, (81.8%). Other materials were cooking gas, petrol and plastics. Burns involving accelerants were 28.2%. They were more extensive, mean TBSA 40%, and frequently involved inhalation, (58.1%) when compared to burns not associated with accelerants.

Table 6*Known injury predisposing factors*

| Factor | Flammable materials | Alcohol | Epilepsy | Mental illness | Dizziness |
|-----------------|---------------------|---------|----------|----------------|-----------|
| No. of patients | 97 | 8 | 4 | 1 | 1 |
| (%) | 88.9 | 7.3 | 3.6 | <1 | <1 |

Most burns were accidental with a few but significant assault cases. Accidental burns were mostly scalds on children while the assault cases were more frequently open flame burns involving adults.

Almost all adult patients and the mothers of children seen had attained some level of formal education. However, only 31.8% of the patients were aware of any risks to burn injuries. Most of the risks cited related to the cooking process and space in the house. These included open cooking fires and lack

of due caution while using fire. The paraffin stove was specifically mentioned as a risk factor.

Less than half of patients, 37.3%, knew any way in which the injuries could have been prevented and only 15.5% were aware of both the risk of fire in their environment and any safety measures. Extra care in the cooking process was the most commonly mentioned potential preventive measure, 66% of patients. Other measures suggested were more room in the house, avoiding paraffin, not being drunk and effective control of seizures.

DISCUSSION

The male to female ratio of 1.24: 1, enhanced to 1.4: 1 in the 0-5 years age group, is in keeping with other studies done in KNH (4, 5). The boy child seems to be more predisposed to burn injury than the girl child.

Most of the patients came from Nairobi and its environs in central province. This may reflect an ineffective referral system for those who are in the periphery rather than an actual discrepancy in burns distribution. Ineffectiveness of the referral process is further supported by the fact that the time from injury to admission was prolonged, the median being 12 hours (mean 54 hours). This delay was accounted for by difficulties with transportation, only 15.5% of patients were brought in by an ambulance. Delayed initiation of definitive resuscitation of burns patients is associated with increased complication rate, especially shock, and mortality. The effectiveness of burn patients referral system needs further scrutiny in view of these findings.

Most of the burns took place at home. Routine processes of cooking and bathing are often the culprits hence the high rates of scalds. Scalds were 51.3% of all the burns but among children below five years the rate was 84.9%. Children were most often scalded in the presence of their parents. Unlike other injury situations, the home has been shown to be relatively unsafe for children with respect to burns. Outside the home, open fires, chemical and electrical burns among adults took a greater significance compared to scalds. There is need therefore to enhance public awareness of the risk of scalds to children at home and find effective means of burn prevention in the homes. This pattern of scalds predominating in children's burns while open flame burns are more frequent among adults has been observed in other studies (4,5).

A bimodal age distribution pattern with peaks in the 0-5 and 21-30 years age groups was noted. The bulk of patients were in the younger group. This reflects the population pyramid pattern on one hand but probably also a relatively higher risk of burn injury to children. Risk factors to childhood burn injuries have been evaluated in other populations. These include child neglect and abuse, traditional healing practices, social economic factors, pre-existing impairment, sibling death from burns and

storage of flammable materials in the house (6,7). In this study 20% of the patients had family members who had suffered burns before, mostly siblings. Other local risk factors for childhood burns will need to be specifically elucidated in subsequent studies to facilitate focused preventive measures.

Burns in adults were frequently open flame type reflecting the use of accelerants in the house for cooking or lighting on one hand and the role of assault on the other. Open flame burns have been shown to be more common in older patients than scalds and they are often more severe injuries involving accelerants. Exposure of the skin to direct high temperatures of a flame, the role of accelerants and ignition of clothing in fire spread are some of the factors that make open flame burns more severe than scalds. While children get burnt more frequently than adults, adult burns are likely to be more severe, in terms of TBSA and depth, and therefore associated with high morbidity and mortality. Limited physiological reserve in young children could however adversely affect the outcome of less extensive injuries. These are factors that will need consideration in the management of burns both in adults and children.

Storage of flammable materials was commonly noted among 89.1% of the patients. Accelerants were involved in 28.2% of burn injuries. Paraffin and cooking gas were the most frequent culprits. Both are essential household supplies but in 10.9% of all cases paraffin was used in assault accounting for 65.4% of all assault burn injuries. Paraffin stove explosions accounted for a further 10.9% of all cases. The mean TBSA when accelerants were involved was 40% and 58.1% of these patients had inhalational component of injury compared with 23.6% in the whole study group. Paraffin accelerated burns have been known to be more severe than other open flame burns and often complicated with inhalational injury which may not be apparent at the time of admission unless bronchoscopy is done. Inhalational burns have been shown to be associated with high mortality in previous studies at KNH, range 54.4-98%. The safe handling of potential accelerants that are commonly used in the homes should be an integral component of any public education campaigns aimed at preventing burns from happening in the homes.

Violence accounted for 16.4% of all the burns, mostly among young adults. The mean age of

assault victims was 24.5 years. This partly explains the second age peak in the 20-30 years group. The author did not find previous documentation of violence associated open flame burns in the literature although the press has reported cases of lynching with tires or use of accelerants. Assault burns were more extensive, deeper and frequent due to open flames than accidental burns. Physicians taking care of burn patients need to be aware of the possible medical legal circumstances in the aetiology of burns and take action to inform relevant authorities when there is such suspicion. Such comprehensive approach to burns management could be helpful towards eventual prevention of repeat incidences in the community.

There were three patients with self-inflicted burns. All were young adult females who attempted suicide using accelerants and sustained severe open flame burns. One of them had known psychiatric disturbances. Self-inflicted burns among adults have been associated with psychiatric illnesses and alcohol intoxication. These are often severe injuries. Appreciation of these facts could enhance holistic approach to the patient who may be in need of psychiatric or other psychological management.

One patient was pregnant at the time of admission. Pregnancy complicated with severe burns is associated with increased maternal and foetal morbidity and mortality. The authors did not find mention of burns complicating pregnancy in our local literature. There were three patients with electrical injuries in the study (2.7%). These happened at home, at work and in the streets in town. The TBSA involved were 1% in all patients but two of them had brief loss of consciousness. The authors found previous documentation of electrical burns in the country to be limited to one study reporting 1% of patients with electrical burns sustained at work. Electrical burns are significant due to the high risk of severe complications even when the patient is apparently well at the time of admission. Exposure to formal education was high in the group though majority had only primary school education. The people who had at least secondary school education showed better awareness of both risk to burns and methods of prevention although statistical significance was only

in the area of prevention awareness. Education standards are closely associated with improved living standards and this difference in relation to burns is expected. The level of education is also likely to affect the structure, content and impact of public education campaigns when these are planned as preventive intervention. Burns have long been recognised as largely preventable injuries with calls for such measures being made (8, 9). The challenge has been translating this into action. Community educational programmes and legislation have been advocated as potentially useful burn preventive measures. Evaluation of preventive interventional programmes has validated their effectiveness in reducing the incidence of fires and burn injuries among certain risk groups. The focus of some of these initiatives has been: child resistant cigarette lighters, protective hoods for fire fighters, fire prevention education games for children, and teaching scald prevention to parents (10-13). The same could potentially be realised in our community.

In conclusion, burn patients admitted to KNH represent only a small part of the potential from the country given the absence of another burns referral unit. Children form the larger bulk of burn victims although this series had a higher proportion of adults compared with reports in the literature. Scald's mainly affected children in this series while adults frequently sustained open flame burns, which were more extensive, deep and frequently associated with inhalational injuries. Assault was prominent in the study as was the role of accelerants in the aetiology of burns. Most patients were admitted many hours after the injury, which could result in increased complication rate.

These patients had a fair level of education and burn risk awareness that could be tapped into through public education campaigns and other preventive intervention strategies to effectively reduce the incidence of burns in our community.

More work needs to be done locally to help understand the socio-economic dynamics underlying burns aetiology to facilitate relevant preventive strategies which have been shown to work in other communities.

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