BURN INJURIES IN ENUGU, NIGERIA - AETIOLOGY AND PREVENTION. A SIX-YEAR RETROSPECTIVE REVIEW (JANUARY 2000 - DECEMBER 2005)


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SUMMARY. Background. Burn injuries frequently occur in our homes and workplaces and during travels. They are a common presentation at the National Orthopaedic Hospital, Enugu, Nigeria, which is a regional centre for burns care and for plastic surgery, orthopaedic surgery, and trauma patients. Most burn injuries are preventable, and campaigns to arouse greater awareness are necessary to reduce the number of occurrences. Objectives. The objectives of this study are to highlight the causes of burn injuries and to characterize age and sex incidences, as also the severity of burn injuries. It is hoped that formidable preventive measures will be suggested to aid public enlightenment campaigns in fighting the scourge of burn injuries. Materials and method. A retrospective review of patient’s folders from Jan. 2000 to Dec. 2005 showed that 414 cases of burn-injured patients were treated at the emergency unit of the National Orthopaedic Hospital, Enugu. Results. Flame burns accounted for 48.3% of burn injuries followed by scalds with 40.6%; chemical burns accounted for 6.3%, while electrical and friction burns accounted for 4.6% and 1.0% respectively. Males made up 60.4% of the cases and females 39.6% (ratio, 1.5:1). The age group most commonly affected was that of children aged between 0 and 10 yr, accounting for 37.2% of cases, followed by the 21-30 yr age group with 22.7%. Altogether, 95.0% of the patients were aged less than 50 yr. With regard to flame burns, 51.5% were due to petrol flames (premium motor spirit), while 33.0% were due to kerosene. Cooking gas explosions accounted for 7.5% of the cases and diesel (automotive gas oil) 1.0%. Of the scalds, hot water accounted for 89.3% and hot oil 7.7%. As to chemical burns, 84.6% were due to acids, with alkalis, corrosive creams, and others making up the rest. With regard to electrical injury, current passage accounted for 63.2% of cases and flash burns for 36.8%.

Introduction

A burn is a wound in which there is coagulative necrosis of the tissue. The majority of burns are caused by heat - other causes are actinic rays, irradiation, chemicals, electricity, and friction. Burn injuries are universal and have plagued mankind from antiquity to the present day. The cause and risk of burn injury are influenced by age, economic circumstances, geographical location, the season of the year, and occupation. In many tropical countries, the low level of socioeconomic development is a major cause of burn injuries.

Flame injury, most often caused by a house fire or ignition of clothing, is the predominant type of injury in patients admitted to burn centres. Overall, scald burns are the most frequent form of burn injury.

“No one is immune from thermal injury, though demographic analysis shows four high-risk groups to be the predominant victims of severe burn injuries. They include the very young, the very old, the very unlucky (National Burn Information Exchange data indicate that 21% of burn victims are innocent bystanders), and the very careless (fully three-fourths of burn injuries result from the victim’s own action).”

Children 6 months to 2 years of age and elderly persons are at particular risk of sustaining burns in domestic cooking and bathing accidents, though our review did not show much involvement of the elderly age group. Young adults are more often injured in the workplace. The majority of burns are of limited severity and extent (more than 80% of all burns involve less than 20% total body surface area). Fire is a very destructive agent. The low socioeconomic level of most inhabitants of the developing countries, like Nigeria, makes burn injury a devastating disaster not only to the patients who live on meagre incomes but also to overburdened dependents. Where such a man is a breadwinner, the entire family members suffer.”

“The personal tragedies involved in serious burning accidents need no elaboration. The cost to the community is high, involving in England and Wales some 60,000 patient-weeks of acute hospital care; the cost to the individual patient is often overwhelming. No scale of values can measure the immense suffering endured by patients with extensive burns: prolonged periods during which painful dressings have to be done every second day, blood
transfusions accepted, hundreds of litres of high protein feeds swallowed, and extensive surgical procedures undertaken; and often at the end of the illness the prospect of further long programmes of plastic surgery to minimize the disability and disfigurement.

Risk factors for burn injury include poverty, poor housing, and poor education. Prevention therefore requires individuals, local communities, and governments to work together. This review was undertaken because of a dearth of data on the situation in our region regarding the common causes of burn injuries in our environment and in order to highlight possible ways of preventing such disasters.

Patients and methods
A retrospective study was carried of the 6-yr period from January 2000 to December 2005 regarding all patients treated in the hospital for burn injuries. The sources of information were the admission registers and the patients’ folders from the medical records department. The information obtained included age, sex, cause of burn injury, total body surface area burned, depth of burn injury, and length of time between injury and time of presentation to the emergency unit. Altogether, 414 patients were analysed with special attention being paid to age incidence, sex incidence, aetiological factors, and specific agents.

Results

Aetiology
Flame burns accounted for 48.3% of the burn injuries, followed by scalds (40.6%), chemical burns (6.3%), and electrical and friction burns (4.6% and 1.0% respectively) (Table I).

Sex
Males made up 60.4% of the cases and females 39.6% (ratio, 1.5:1) (Table II).

Age distribution
The age group most commonly affected was that of children aged between 0 and 10 yr (37.2% of the cases), followed by the 21-30 yr age group (22.7%) (Table III). Altogether, 95.0% of the patients were aged less than 50, while 57.8% of the patients were aged between 11 and 50.

Distribution of aetiological agents
With regard to flame burns, 51.5% were due to petrol flames (premium motor spirit) and 33.0% to kerosene. Gas explosions accounted for 7.5% of the cases and diesel for 1.0%.

Of the scalds, hot water accounted for 89.3% of cases and hot oil for 7.7%.

As to chemical burns, 84.6% were due to acids, the rest being due to alkalis, corrosive creams, and other causes.

Flash burns accounted for 36.8% of all electrical injuries.

Among male patients, 47.6% were affected by flame, followed by scalds (38.4%), electrical burns (7.6%), chemical burns 6.0%), and friction burns (0.4%), while of the female patients 48.8% suffered from flame burns, 45.1% had scalds, and 6.1% had chemical burns. No female had electrical injuries.

In patients aged less than 16 yr, the majority had scalds (74.3%), distantly followed by flame burns (22.5%); 2.1% of children had chemical burns and 1.0% had electrical burns.

However, 69.8% of patients above 16 years of age had flame burns as against 12.4% with scald injuries; 9.8%, 7.6%, and 0.4% of the adults had respectively chemical, electrical, and friction burns.

Discussion

Flame constitutes a major source of burns in Nigeria. This is similar to what obtains in both the developing and the developed worlds. Scald burns are the most frequent form of burn injury overall in the United States, leading to over 100,000 visits to hospital emergency departments each year; they are however responsible for slightly less than one-third of all burns requiring hospital treatment.

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<th>Table I - Aetiology of cases</th>
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<th>Table III - Age group</th>
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Similarly, in our series, flame burns were the commonest cause (48.3%), followed by scalds (40.6%) and chemical burns (6.3%), with electrical and friction burns accounting for 4.6% and 1.0% respectively. This correlates with findings in most other African centres except Port Harcourt, Nigeria, where scalds (48.9%) narrowly surpassed flames (47.8%), as reported by Datubo-Brown and Kejeh.\(^{11}\) Fasika,\(^{12}\) reporting that fire - often petrol flame - was the commonest cause of burns in his study of a 4-yr period in Ibadan, noted an escalation of cases associated with fuel scarcity. Moist heat came second in Fasika’s series, with 16%, while chemicals and electricity were the cause in 5% and 2% respectively. From Liberia (West Africa), Markelov\(^{14}\) reported a similar aetiology of burns: all his burn patients in Liberia were suffering either from scalds or from flame burns, while Hag\(^{13}\) reported that burns were the third commonest cause of surgical admission to a Kenyan (East Africa) provincial hospital, with open fire constituting the largest cause (69.3%), followed by scalds (19.2%), chemical burns (4.1%), and electrical burns (7.4%).

As said, males accounted for 60.4% of cases and females 39.6% of cases, representing a male-to-female ratio of 1.5:1. This is consistent with the reports of male predominance in burn injuries reported by most workers.\(^{12-16}\)

The age group most commonly affected by burn injuries was that of children aged 0 to 10 yr, accounting for 37.2% of cases; of all children aged below 16 yr, the majority (74.3%) had scalds, mainly due to hot water meant for beverages or bathwater that was being kept in a kettle or bowl awaiting mixing with cold water or because of children bumping into adults carrying hot fluids. This cause was followed by flame (22.5%) and chemical (2.1%) and electrical burn injuries (1.0%). This is similar to an earlier finding by Iregbulem and Nnabuko,\(^{13}\) who showed that hot liquids were the predominant aetiological agents, being responsible for 81.8% of burn injuries (527 cases) among our paediatric patients at the National Orthopaedic Hospital, Enugu, followed by flame (14.7%).

However, among patients aged 16 yr and over, flame burns were predictably the commonest type (69.8%), followed by scalds (12.4%), chemical burns (9.8%), electrical burns (7.6%), and friction burns (0.4%). As also noted by Fasika\(^{12}\) in Ibadan, petrol flame was the commonest cause in our series and periods of escalation coincided with periods of fuel scarcity, together with increased storage and transportation of petrol and seasons with higher rates of pipeline vandalism. This was followed by kerosene flames, in which cases the greatest number of accidents occurred when patients were attempting to refill a lighted lantern, causing an explosion, while other accidents were due to patients refilling a lighted kerosene stove or to clothing igniting from ground level cooking fires.

### Prevention

Risk factors for injury include poverty, poor housing, and poor education. Prevention therefore requires individuals, local communities, and governments to work together.\(^{19}\)

The development of strategies for burns prevention needs to consider both active and passive approaches.\(^{20}\)

Active action implies changes in individual lifestyles and includes health education for injury prevention and family planning. Passive action seems to be better accepted, because of the possible short-term results.\(^{21,22}\)

We accordingly join all other authors who have written on burns prevention, especially Olaitan and Olaitan,\(^{9}\) in maintaining that burn injuries can be prevented or markedly reduced by education, by public awareness campaigns, by making homes and work and leisure places safer, and by legislation.

Looking closely at our series, we can see that the majority of children affected were too young to understand the implications of knocking hot water off shelf tops or cooking stoves in the kitchen or of pulling down tablecloths along with hot water meant for beverages. Clearly, parents must be adequately educated about the need to ban all young children from the kitchen while cooking is going on and about the importance of never leaving children alone with hot fluids even for a minute; also, people who have to leave their children with home helps or older children should give strict instructions to avoid cooking and to observe certain safety measures. People must learn to leave hot fluids in the kitchen where they are safe and, when carrying water, to carry the cold water to the hot in order to avoid accidents - cold water must always go to hot water and not the other way round.

In our series, while many patients did not know about the dangers of refilling lighted lanterns, cooking stoves, or generators, a good number did know but had been doing it until the fateful day of the explosion - this also points an accusing finger at the government, which allows the adulteration of petroleum products or even participates in it, although a good number of times the explosions have been known to follow the release of kerosene fumes.

Publicity jingles should be intensified on radio and television media, and emphasis should also be placed on both the long- and the short-term consequences of burn disasters. People should be encouraged to visit hospitals and burn centres from time to time because seeing victims will leave a longer-lasting impression than just hearing about burns.

We also discovered that a good number of people who used chemical substances like acid for assault were not aware of the extent of the damage they could cause and that they obtained these substances easily. We join other workers in calling for strong legislation against use and possession of such substances so that only those who can account for their use can obtain them - and even then the quantities must be regulated. When used for assault, investigations should lead to the source of the substance and all defaulers must be appropriately punished. There should also be a law against commercial vehicles (especially) or
private vehicles carrying gallons of petrol on board while travelling, because many road traffic accident patients with burn injuries in our series had been travelling in vehicles carrying loads of petrol. The storage of petrol at home should also be discouraged. These accidents often coincided with periods of scarcity, thus further indicting the government. Nevertheless, despite the perceived faults and the contribution (or lack of it) of our government, people must look after themselves and education must be intensified.

**Conclusion**

We conclude by borrowing the words of the Chinese philosopher Kuan Tzu: “if you plan for one year, sow rice; if you plan for ten years, plant trees; if you plan for a hundred years, educate people.”

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**RÉSUMÉ. Eléments de base.** Les brûlures se produisent fréquemment dans la maison, au travail et pendant les voyages. Les cas de brûlures constituent une présence très commune à l’Hôpital Orthopédique National d’Enugu, Nigeria, un centre régional pour le traitement des brûlures et pour les patients qui nécessitent des interventions de chirurgie plastique, de chirurgie orthopédique et pour des traumatismes. Il est possible de prévenir la plupart des brûlures, et des campagnes de sensibilisation sont nécessaires pour réduire la fréquence des cas. *Buts*. Les Auteurs de cette étude se proposent d’examiner les causes des brûlures et de caractériser leur incidence du point de vue de l’âge et du sexe, comme aussi de leur sévérité. Il faut espérer que des mesures importantes de prévention soient proposées afin de favoriser des campagnes d’éducation destinées au grand public pour combattre le fléau des brûlures. *Matériaux et méthode*. Les Auteurs ont conduit un examen rétrospectif des dossiers des 414 patients traités entre janvier 2000 et décembre 2005 à l’unité des urgences de l’Hôpital Orthopédique National d’Enugu, Nigeria. *Résultats*. Les flammes étaient la cause de 48,3% des brûlures, suivies par les ébouillantements (40,6%), les brûlures chimiques (6,3%), électriques (4,6%) et par friction (1,0%). Les patients mâles constitué 60,4% des cas et les femelles 39,6% (rapport, 1:5:1). Le groupe d’âge le plus atteint était celui des enfants de 0 à 10 ans (37,2% des cas), suivi par le groupe de 21-30 ans (22,7%). Le 95,0% des patients avaient moins de 50 ans. Pour ce qui concerne les brûlures par flammes, le 51,5% a été causé par des flammes d’essence (essence d’auto-mobile de première qualité) et le 33,0% par le kérosène. Les explosions du gaz en cuisine étaient responsables de 7,5% des cas et le diesel (gazol pour automobiles) 1,0%. Pour ce qui concerne les ébouillantements, l’eau chaude a causé le 89,3% des cas et l’hui-le chaud le 7,7%. Quant aux brûlures chimiques, le 84,6% était causé par les acides et les autres par des substances alcalines, des crèmes corrosives et d’autres substances. Pour ce qui concerne les brûlures électriques, le 63,2% des cas ont été causés par le passage de courant électrique et le 36,8% par éclair électrique.

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**BIBLIOGRAPHY**


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