

BURNS IN NIGERIA: A REVIEW

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SUMMARY. Burn injuries continue to be a major source of mortality and morbidity in low- and middle-income countries of the world, of which Nigeria is a part. Overview data on burn care in Nigeria are sparse but the available literature on burns and burn care in Nigeria was retrieved through Internet-based search engines, collated, and reviewed. Peculiarities of epidemiology, types of burn, pattern of injuries, complications, and outcome of burn care were reviewed. There were no broad-based overview statistical data on burns in Nigeria in all the articles reviewed. There was no documentation on the regionalization of care and there were no national databases. All reports on epidemiology were hospital-based. Flame is emerging as the predominant cause of burns, and burn injury is occurring increasingly away from the domestic setting. The severity of the injuries is also increasing. Deliberate burn injury remains a practice and a wide range of complications occur as burns sequelae in Nigeria. Several challenges militate against optimal care for burn victims. Burn injuries continue to contribute significantly to the burden of disease in Nigeria. There is a need for broad-based data collection systems. Avoidable complications are common and mortality remains high. Pooling of resources by regionalization of care could increase focus on burn prevention and improve the care of burn victims. Nongovernmental and governmental support to reduce the burden of burns is advocated.

Keywords: burns, Nigeria, review

Introduction

Burn injuries continue to be a major source of mortality and morbidity from trauma in many parts of the world, particularly in the low- and middle-income countries.^{1,2} Nigeria, the largest country in west Africa, with a population of about 140 million people, belongs to this category.

Although preventable, burn injuries commonly occur. Globally, fire-related burns were responsible for 238,000 deaths in 2000¹ and burns were the eighth commonest cause of mortality³. Over 95% of fatal fire-related burns occurred in low- and middle-income countries. In India, with a population of about 1 billion, 700,000-800,000 burn admissions are managed yearly.⁴ Four million women suffer severe burns from fire each year worldwide - the same number as those diagnosed with HIV/AIDS.³ However, it does not appear that burn injuries have attracted the same degree of public health concern.

In many parts of the world, the pattern and epidemiology of burns are well defined. The regionalization of care and adequate data collection systems have ensured both the accurate documentation of cases and a more detailed study of burns in these countries.

In Nigeria, there is a paucity of work on the overview of burns and burn care across the country. Such an overview would, no doubt, have an impact on burn care planning and prevention.

The purpose of this article is to review and summarize the publications available on the current state of burns and burn care in Nigeria. This overview could shape research efforts and guide policy decisions, in order to improve efforts at burn prevention and the management of burn patients in Nigeria.

Materials and methods

The available literature on burns in Nigeria published in English was searched from Internet data bases as well as journals that focus on trauma and burn care, from the period 1969 to 2009. Older publications were excluded due to inaccessibility and since they may not reflect the current state of burns and burn care in Nigeria. The articles were reviewed and information retrieved from them with regard to the region of the country, the epidemiological characteristics of the burns, and the pattern of injuries as well as complications arising from burn injuries. The modalities of management of patients reported in various

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articles were also retrieved, as was the outcome of burns management.

Results

The results are summarized under the various headings as presented.

Epidemiology

The available statistical data on burn epidemiology are predominantly hospital-based. Burn injuries account for 4.8% of trauma deaths in Nigeria⁵ and 6.7% of surgically related deaths.⁶ In children, burns and scalds are the fourth commonest cause of trauma after road traffic accidents, accidental falls and bites.⁷⁻⁹

In south-western Nigeria, flame accounted for 65-71% of burn injuries in Ile-Ife.¹⁰ Flame burn disasters in the recent past have contributed to an increase in the incidence of flame burns.¹¹⁻¹⁴ Many such reports were from southern Nigeria. Disasters have also occurred owing to deliberate damage, the pilfering of gasoline from underground pipelines, and the contamination of kerosene, a common household fuel, by gasoline during storage or transportation. Accidents usually occurred while filling up lighted kerosene lamps and cooking stoves, resulting in explosions.¹⁴

Aetiology

Earlier studies demonstrated that the commonest cause of burn was scald injury,¹⁵⁻¹⁷ but flame burns now appear to be on the increase.¹⁸⁻²² Scald injuries however continue to predominate in paediatric studies,²³⁻³⁰ although some studies from Northern Nigeria still report flame burns as the commonest cause of injury in the paediatric age group particularly during the season of the dry and dusty Harmattan wind.³¹

Chemical burn injuries are infrequent in comparison to flame burns but are becoming increasingly common.^{32,33} They constitute 6.3% of burns in Enugu (south-eastern Nigeria)¹⁸ and 5% in Ibadan (south-western Nigeria). The pattern of injuries is similar to that reported from various other parts of the world (*Fig. 1*).³⁴

Some chemical burns also occur because of accidental contact with, or ingestion of, caustic soda powder or liquid used in soap production. This usually results in orofacial and oesophageal burns.³⁵ Many such makeshift 'factories' are sited inside houses, making this a common domestic accident.

Electrical burn injuries have an incidence of less than 1% in children² and 2.8-4.6% in all burn patients^{33,36-38} in south-eastern Nigeria. Low-voltage injuries are more common, constituting about two-thirds of cases.³⁷ High-voltage injuries also occurred, usually being work-related and caused by poor safety precautions when working on



Fig. 1 - Patient with chemical burn injury to the face.

telecommunication equipment and high-tension cables.^{38,39} There is a male preponderance of 5:1 and limbs are commonly affected.

Lightning strikes were also reported as an uncommon cause of burns in the eastern and north-western parts of the country.^{38,40}

There were no reports of radiation burns in the studies reviewed.

Pattern of injuries

• Age and gender distribution

The commonest age group of burn patients from Port-Harcourt (south-eastern Nigeria) and Zaria (northern Nigeria) was the under-5 age group, with equal gender distribution.^{15,19,31} A higher incidence of childhood burn injury was noted in females from Ibadan (south-western Nigeria), with a female to male ratio of 2:1 and flame burns accounting for 56.5% of the cases.

• Location of injuries

Traditionally, most burn injuries reportedly occurred in the home in up to 80% of patients,^{2,24,42,43} with scald and flame sharing a similar incidence of 49% and 48%, respectively.^{19,22,29,35} These domestic accidents commonly occur

cur in toddlers accidental falling onto hot fluids or naked flame. Domestic burn disasters have however also been reported to occur owing to the adulteration of kerosene, a common domestic fuel, with gasoline, which increases its flammability.¹²⁻¹⁴

In recent years, burn injuries occurring in vehicles in road traffic accidents resulting in mass burn casualties^{22,44} have become increasingly common, accounting for over 50% of injuries at a certain period in Ibadan. Such accidents are usually due to the transporting of gasoline in vehicles whose drivers use unsafe containers, particularly during periods of petrol or gasoline shortage.⁴⁴

Burn disasters from gasoline pipeline explosion fires¹¹ also contributed significantly to the increase in burn injuries outside the domestic setting in Nigeria. The injuries typically caused many more eventual deaths.

Chemical burns were also suffered in acts of assault, as also burns from the ingestion of caustic soda customarily stored in the home.

Electrical injuries commonly occurred as occupational hazards in electricians working on high-tension electricity cables with poor safety precautions.

- Deliberate burn injury

The use of deliberate burn injury to 'treat' children suffering from febrile convulsions was documented in different parts of the country.^{17,19,32,33,35,36} This is a fairly old practice, but recent reports still document this type of injury (Fig. 2).^{15,28,45-48}



Fig. 2 - Patient with deliberate burn injuries to both feet.

Burn injury from deliberate self-harm was reported in northern Nigeria.⁴⁹ Most of the patients had no prior history of psychiatric illness, the burns were usually very severe, and the mortality high.

- Seasonal variation in incidence

Seasonal variations in the incidence of burns were well documented in northern and eastern Nigeria, where the peak incidence of burns occurred in the mid-Harmattan season, from December to January.^{15,22,31} During this period, mean air temperatures and relative humidity are lowest, and the extreme cold at night necessitates the use of wood fires to warm homes while people are asleep. This often results in burn injuries. The practice of bush burning for agricultural purposes, which is common in this season, may also contribute to the higher incidence of burn injury.

- Severity

There was an increase in the pattern of severity of burn injury across the country.^{19,50,51} This came with an increased incidence of inhalation injury, which also contributed significantly to mortality.

- Site of body involved in burn injury

Facial burns occurred in over 25% of all cases of burns.¹⁰ Involvement of the neck and trunk is also common, when flame burns occur owing to kerosene lamp explosions. The trunk was the most commonly involved body part (56.4% of cases; upper limbs, 51.3%; lower limbs, 48.0%; head and neck, 28.8%; lower limbs, 50.0%).¹⁴ The target of chemical burns by assailants was usually the head and neck region, and ocular complications were common.¹⁹

In deliberate burn injury, the feet are most commonly involved (Fig. 2), leading to the occurrence of flexion contracture of the great toe (hallux flexus)⁵² and of other digits.

Complications

1. Wound infection

Wound infection was the most commonly reported complication of burn injury in Nigeria, with infection rates of 15-20% in the northern part of the country,^{15,31} 22-27% in the south-eastern part,^{22,53} and 24-34% in the south-western part.^{24,41}

Wound bacteriology is sometimes hampered by poverty, with culture rates as low as 25% being reported⁵⁴ and wound biopsy cultures giving significantly higher microbial isolation rates than wound swab cultures.⁴⁴

2. Organisms

Gram-negative organisms are the commonest microbes isolated from burn wounds in different parts of the country, constituting 64-72% of isolates in south-western Nigeria,⁴⁴ 65% in northern Nigeria,³¹ and over 70% in south-eastern Nigeria.

Klebsiella species were the commonest organisms implicated in burn wound infection in Ibadan, followed closely by *Pseudomonas aeruginosa* and *Staphylococcus aureus*.^{24,29,41,44,55,56}

In Osogbo (south-western Nigeria), *Staphylococcus aureus* was isolated in 50% of the patients, followed by *Pseudomonas* and *Proteus* species.

Klebsiella species were also the commonest isolates from Enugu, followed by *Staphylococcus aureus*. This order was however reversed in northern Nigeria, with *Staphylococcus aureus* being the commonest organism followed by *Proteus* and *Klebsiella*.³¹

3. Resistance to antibiotics

Multidrug resistance to common antibiotics was common.^{44,54,55,57} Third-generation cephalosporins appeared to have the least incidence of resistance, with a sensitivity of 93.5%.^{44,54,55} Antimicrobial resistant *Pseudomonas aeruginosa* was found in 62.7% of burn wounds managed in Benin (mid-western Nigeria).⁵⁷

4. Inhalation injury

The incidence of inhalation injury in Ibadan was 16%.⁵⁸ The diagnoses were only clinical as neither fibre optic bronchoscopy nor ventilation scanning was employed. The occurrence of inhalation injury was commoner in patients with a high percentage of burns involving 50% of the total body surface area or more.⁴¹

5. Psychological morbidity

A high level of anxiety and depression was reported in up to 65% of burn patients managed in Lagos.⁵⁹

6. Measles was reported as a complication of major burns in 5.6% of children with burns in northern Nigeria.³¹

7. Amputations

Burns were responsible for extremity amputations in 2.1% of the patients in a review of indications for amputations in Nigeria.⁶⁰

8. Post-burn contractures and hypertrophic scars were a common late complication of burn injury in Nigeria. The incidence of post-burn contractures was 8.6%-20% in northern Nigeria,^{15,31} 11-13.5% in western Nigeria,^{17,60} and up to 55% among epileptic patients who sustained burns in eastern Nigeria.⁶¹ The commonest sites of contracture include anterior neck region (mentosternal) contractures, axillary contractures, hand contractures, and eyelid contractures (ectropion). In deliberate burn injury, contractures of the toes are common, while perineal contractures are very rare.⁶²

The incidence of Majorlin's ulcer as a complication of burns is not documented in any of the articles reviewed. In south-eastern Nigeria, 21 cases arising from burn scars were reported over a 30-yr period, from a review of histopathological data. There was a male preponderance of 3:1 and a mean age of 39 yr.⁶³ Burn scars were the commonest cause of Majorlin's ulcer.⁶⁴ Two cases of Majorlin's ulcer from burns were reported from Lagos in south-western Nigeria.⁶⁵ Most of these patients sustained burns in childhood. An early onset of Majorlin's ulcer, occurring two years after burn injury was reported in an 18-yr-old.⁶⁶

In northern Nigeria, a review of skin cancers revealed that poorly managed or neglected chronic burns were the preponderant cause of squamous cell carcinoma.⁶⁷

Severe burns in pregnancy⁹ were associated with an

abortion rate of up to 90% and a maternal mortality of about 50%.⁹

Less commonly reported long-term complications of severe burns reported from Nigeria are significant low sperm count and hypomotility and a significant reduction in key indices of sperm quality.⁶⁸

Management

• Pre-hospital care

In this review recent attempts to create trained rescue squads for rescuing fire victims from burn zones were limited to urban areas. The retrieval of victims and their conveyance to hospital were usually left to willing eyewitnesses and passers-by.

Supposed "first aid" practices, such as the application of engine oil, palm oil, dry salt, raw eggs, etc., remained common²⁸ and often increased morbidity in burn injuries.

Late presentation to hospital was common, with up to 50% of burn victims presenting to hospital 24 h post-injury.^{2,28,37}

• Hospital care

Hitherto many health care facilities did not have dedicated burn units^{19,31,35,69} but more recently such units are being established in many tertiary hospitals.^{22,44,70}

Standard hospital burn care in Nigeria is hampered by inadequate facilities and infrastructure and by a paucity of adequately trained staff.^{31,69} Patients have to pay directly for burn care treatment owing to the lack of a broad-based health insurance scheme.⁵⁰

While standard fluid resuscitation for burn patients is common practice,³⁷ the use of early burn wound excision and skin grafting for deep burns has yet to become the norm in most centres. In centres where these practices were part of normal protocol, many patients were still not being managed using such protocols for economic, social, logistic, and infrastructural reasons that severely condition the care of the patients.^{10,41}

There was no documentation on the functioning of skin banks, and there were no reports on the use of skin substitutes. The potential use of amniotic membranes as a temporary dressing in extensive burns was hampered by sociocultural factors which prevent mothers from consenting to its use. These factors include, fear of the amnion being used for rituals, and the false belief that a baby may be harmed if its amnion is used for another person.⁷¹

A shortage of well-trained nurses to care for burn patients has led to the employment of burn patients' relatives to assist in nursing care.³¹ Mothers are most commonly so employed to care for paediatric burn patients although domestic pressures on such mothers can result in the premature discharge of paediatric burn patients from hospital.³¹

The lack of respirators in many centres,^{31,58} as also the

shortage of anaesthesiologists, had negative implications for the management of patients with inhalation injury. The diagnosis is still largely clinical.

Outcome

The crude mortality rate was 26% at Port Harcourt,¹⁹ reaching 63.5% for major burns in Enugu. In northern Nigeria mortality rates of 13% for childhood burns increased to 19% in major burns and 29% for neonates, scalds (9%) for scalds and 16% for flame burns.³¹ Crude death rates of 35% and 100% mortality once burn shock has developed.⁷²

In south-western Nigeria, a mortality rate of 19.4% was reported from Osogbo,²² 1% from Lagos¹⁴ and 7.7 from domestic burns in Ilesa.²⁴ The overall mortality in paediatric burns in Ibadan was 34% and increased significantly in patients with inhalation injury to as much as 78%.^{41,58} The percentage of TBSA, inhalation injury, and wound infection were identified as significant predictors of death from burns in Nigeria.^{10,41}

Burn autopsies

There are few reports on burn autopsies in Nigeria. In Ibadan, burn coroner autopsies constituted 4.6% of autopsies with an autopsy rate of 35.2%.⁷⁰ The resistance to performing autopsies on burn patients is due to factors including inability to secure relatives' consent, and their unwillingness to pay for such autopsies, since such medical services are usually on a pay-for-service basis.⁵⁰

In Lagos, electrical burns were the most commonly observed in burn autopsies.⁷⁰ This is a reflection of the increasing incidence of electrical burn injuries, particularly in an urban and industrialized setting like Lagos. Many of the accidents were caused by the electrocution of men working on high-tension electricity cables. There appears to have been an under-reporting of this form of injury as many of the patients who died from electrocution in Lagos, south-western Nigeria, had sustained burn injuries which were discovered at autopsy and are usually not reported as such.⁷⁰

In a report on autopsy subjects from Jos, North Central Nigeria, whose deaths were a cause of litigation, no burn autopsies were reported.

Prevention

Although burn prevention programmes and strategies have been highlighted,^{18,73} there are no studies of the outcomes of the implementation of burn prevention programmes or of the impact of legislation on the reduction of burns, as reported from other countries.^{74,75}

Studies on burn safety knowledge among adults and children in Ile-Ife, south-western Nigeria,^{35,76} revealed a poor understanding of burn prevention strategies, the exposure of children or wards to potential burn agents at an

early age, and ignorance of simple first-aid measures to be applied in the event of burn injury.

Discussion

The hospital-based nature of most studies on burns epidemiology in Nigeria makes the determination of the true incidence in the general population uncertain as many patients seek care from alternative medical practitioners or else resort to self-medication because of poverty and ignorance. The result is a measure of under-reporting in such hospital-based data. Also, the data come mainly from tertiary hospitals, i.e., excluding district hospitals and private health care facilities where less severe cases of burns are usually managed without referral.

A more detailed and broader-based reporting system is required for adequate documentation of the incidence of burn injuries. The establishment of a Nigerian national data bank for the reporting of burn injuries in order to collate data from the various parts of the country is imperative if we are to determine the true incidence of burn injuries in the general population and plan care and prevention strategies. All registered hospitals should make periodic reports of burns injuries to this database.

It appears that flame burns are becoming the most frequent cause of burns. The mass occurrence of flame burns in disasters may be contributing to this trend.

It may also be due to the fact that most patients with minor burn injuries, which often result from scalds, do not present for treatment to teaching hospitals, where these reports were made.

Electrical burn injuries are probably under-reported since many patients with severe electrical burns who die are usually simply reported as cases of electrocution, without any documentation regarding the electrical burn component of their injury. This can usually be diagnosed on autopsy but, with a low autopsy rate,⁷⁷ many such victims go unrecorded.

The rising incidence of chemical burns due to assault is a cause of concern. There is a need for the direct involvement of law enforcement agents at hospitals when such patients present. Many cases occur as crimes of passion due to attack or assault by aggrieved 'lovers'. The victims' overriding concern to care for themselves and to restore their body image after this kind of attack usually puts them in no position to prosecute their assailants.

Poverty, urban migration, and mass illiteracy have been observed as contributing factors in the increase of burn incidence in Nigeria⁴³ and probably holds true with respect to the practice of deliberate burn injury to treat convulsions. Though held to be on the decrease,³⁵ the practice has not been completely eradicated, as recent cases still report. Treating this practice as child abuse punishable by law should could serve as a deterrent.

The increasing frequency of burn injuries away from the home setting means that issues of safety in the public space require more attention.

The seasonal variation in incidence also calls for increased efforts at public campaigns on prevention during the Harmattan season. Legislation and surveillance of the practice of bush burning as an offence punishable by law could go a long way in this regard.

Burn and/or trauma rescue teams are long overdue. Their role in the prompt retrieval of burn victims, the setting-up of early fluid therapy, and appropriate first-aid care and early presentation to hospital should significantly reduce the morbidity and mortality from burn injuries.

The absence of well-organized ambulance services and paramedics makes the pre-hospital care of burn patients in Nigeria poor and sometimes harmful.

The increasing severity of burns means that a strong case can be made for the regionalization of burn care in Nigeria, as was earlier suggested.⁷⁸ This will no doubt improve data collection efforts, encourage the training of burn care personnel, promote studies in burn research, and facilitate the maximum utilization of available funds to establish burn support facilities such as skin banks.

Burn wound infection rates are rather high and the common occurrence of multi-drug resistance seen in some studies reviewed is of concern. The routine empirical use of antibiotics should be discouraged as they may prove to be counterproductive.⁵⁶

The high rate of development of post-burn contractures observed in the review is unacceptable and is a reflection of the poor state of burn care in the country.

The funding of the care of burn victims is a matter of urgent importance. The current pay-out-of-pocket situation that obtains should be corrected as outcomes have been closely linked to the patients' capacity to pay for the necessary drugs and care.⁵⁰ The institution of broad-based health insurance or donor-funded care for burn victims should be put in place as most patients are unable to cope with the high economic cost that burn injuries result in.

Further studies on the outcome of burns and their economic impact in Nigeria are suggested. The use of disability-adjusted life years (DALYs) - a WHO calculation of the number of productive years lost owing to the burden of having a certain disease or disability like burns - will assist in evaluation.⁷⁹ The true contribution of burns to poverty and underdevelopment may thus be further as-

sessed.

Current efforts at burn prevention should be strengthened. Increasing public awareness, legislation for the incorporation of fire safety designs into buildings, and legislation on the use of fire extinguishers, fire alarms and smoke detectors should be enforced. Public organizations should conduct regular fire drills and staff should be trained in basic life support techniques.

The International Society of Burn Injuries, together the World Health Organization has created a 10-year plan for burn prevention and care,⁷⁹ the goal of which is to develop burn control measures, improve burn care and burn surveillance, and achieve better data collection, research, and training.

Ignorance continues to be a major impediment to burn care and prevention in Nigeria. In our population the low autopsy rates will limit improvement in the understanding of the burn process. There is a need to educate people on seeing autopsy in this light. The restriction on the use of amnion as a potential skin substitute may also be overcome.

The establishment of burn survivor groups should be encouraged to enable burn patients interact, assist in group therapy for many of the chronic complications which they suffer and form a basis for advocacy groups that can impact on community participation in burn care. They may assist in prosecuting assailants in acid burn attacks.

The management of burns is both capital and labor intensive. Poverty therefore continues to be a major impediment to caring for burn patients. The absence of a broad-based health insurance scheme means that burn victims have to pay out-of-pocket for services, and inability to pay has been associated with a worse outcome.^{14,49}

Conclusion

Burn injuries continue to contribute significantly to the burden of disease in Nigeria. There is need for coordinated efforts at establishing broad-based data collection systems to determine the true incidence of the disease in the general population. Avoidable complications are common and mortality remains high. Pooling of resources by regionalization of care may help improve the outcome of care for burn victims. Massive public health campaigns on the prevention and care may help avoid some of these problems.

RÉSUMÉ. Les brûlures continuent d'être une cause importante de mortalité et de morbidité dans les pays à revenu faible, y inclus le Nigeria. Les informations limitées disponibles de caractère général sur les brûlures et les soins relatifs ont été extraites moyennant des moteurs de recherche colligés avec l'Internet, collationnées et examinées. Les particularités de l'épidémiologie, des catégories des brûlures, de l'étiologie, des complications et des résultats finals des soins ont été examinées. Dans toute la littérature consultée les Auteurs n'ont trouvé aucune étude sur large base des données statistiques sur les brûlures au Nigeria ni aucune documentation sur la régionalisation des soins ni aucune base de données nationale. Toutes les relations scientifiques de nature épi-

démiologique provenaient directement de sources hospitalières. Les Auteurs ont constaté que les flammes commencent à être la cause principale des brûlures et que les lésions qu'elles provoquent se produisent de plus en plus fréquemment loin de l'environnement domestique. La gravité des lésions est également en augmentation. Au Nigeria les brûlures causées délibérément continuent à se produire et les complications postbrûlure causent une vaste gamme de séquelles. Pour diverses raisons il n'est pas toujours possible d'offrir aux patients brûlés les soins optimaux. Les brûlures continuent à contribuer en manière significative au fardeau de la maladie au Nigeria. Il faut créer des systèmes de collection de données sur large base. Certaines complications évitables sont communes et la mortalité reste élevée. La mise en commun des ressources grâce à la régionalisation des soins pourrait augmenter l'attention dédiée à la prévention des brûlures et améliorer la prise en charge des victimes de brûlures. Les Auteurs souhaitent que les autorités gouvernementales et non gouvernementales puissent appuyer les efforts pour réduire le fardeau pesant des brûlures.

Mots-clés: brûlures, Nigeria, étude globale

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