Case Report
African Journal of Paediatric Surgery
Vol. 4 (1); Jan - Jun 2007

Predictors of Mortality in Paediatric Burns at Ibadan, Nigeria

Odeyinde S.O., Ademola S.A., Oluwatosin O.M.
Division of Plastic and Reconstructive Surgery, University College Hospital, Ibadan

Abstract

Background: Burn injury constitutes a major cause of trauma related morbidity and mortality. Improvements in care have resulted in reduced mortality in the burn patient significantly. The aim of this study was to determine the outcome and management of burns in children.

Patients and Methods: This was a prospective study of children aged 0-13 years, managed in the burns unit of University College Hospital, Ibadan, Nigeria, between January 2001 and September 2003.

Results: There were 62 patients, 42 (67.7%) were females and 20 (32.3%) were males (Male: Female= 1:2. Their ages ranged between 1month and 13 years (mean = 4.8 ± 3.8 years). Majority of the patients (56.5%) were below 4 years of age. Burn was caused predominantly by flame (57%), followed by inhalation injury in 43.5% of the patients. The percentage total burn surface area (%TBSA) ranged between 1% and 95% (mean 29.7% ± 22.8%), and 41.4% of the patients sustained a major burn (TBSA = 30%).

Infective complications were present in 37% of patients. The overall mortality was 33.9%, and occurred in those patients with %TBSA of 14 95% (mean = 48.8%). Mortality rate was 62.9% among those that had inhalation injury compared with 11.4% in those without inhalation injury. There was no mortality in those patients whose %TBSA ranged between 1 and 32% (mean = 17.5%).

Conclusion: Percentage of the total body surface area burnt and the presence of inhalation injury were important predictors of mortality in childhood burns injury.

Key Words: Burns, Children, Mortality

Introduction

Burn injury poses a major threat to the health of children in many nations of the world[1], inhalation injury, burn size (Total Body Surface Area, TBSA), and age have been cited as independent risk factors for mortality in paediatric burn[2,3]. Improvements in the management of burned patients has increased the chances of survival within the last fifty years[4,5]. The improved survival resulted from a better understanding and treatment of burn shock[6], aggressive wound management, advances in intensive care and metabolic support[7,8], and improved respiratory care. The improved survival observed in recent years applies to all age groups, particularly the paediatric age group[9,10]. The purpose of this study was to examine the pattern of burn injury in children and identify the factors that predict mortality in paediatric burns injury.

Correspondence: Dr S.O. Odeyinde, i/c Dr S.A. Ademola, Division of Plastic and Reconstructive Surgery, College of Medicine, University of Ibadan, P.M.B. 5116, Ibadan, Nigeria

Patients and Methods

This was a prospective study of all children aged 0 to 13 years, who sustained burn injury and were managed at the Burns Unit of the University College Hospital, Ibadan, Nigeria, between January 2001 and September 2003. Their data were retrieved from the database of the burns unit.

The management of burned patients included admission to the burn unit within 24 hours of injury, aggressive resuscitation regimen and initial conservative management of the burn wound. Burn wounds that failed to heal within three weeks were excised and autografted if there were no contraindications to surgery and complications were attended appropriately.

The data were analyzed included age, sex, aetiology of the burn, %TBSA burnt, inhalation injury, infective complications, and outcome. Analysis was by Statistical Package for Social Sciences (SPSS) version 10 computer software. Descriptive and binary logistic regression analyses were performed on the data.

Copyright © 2007 African Journal of Paediatric Surgery

Table 1: Aetiology of the Burn

Aetiology	Frequency	Percent
Kerosene Flame	27	43.5
Petrol Flame	3	4.8
Scald	22	35.5
Contact	2	3.2
Chemical	2	3.2
Electricity	1	1.6
Other sources of Flame	5	8.1
Total	62	100.0

Table 2: Place of Occurrence of the Burn

Location	Frequency	Percent
Home	55	88.7
Work	1	1.6
Other Building	3	4.8
Vehicle	1	1.6
Other	2	3.2
Total	62	100.0

Table 3: Logistic Regression

Variable	Significant (p-value)
Age	0.369
Sex	0.571
Aetiology	0.068
% TBSA burnt	0.000*
Inhalation Injury	0.003*
Infective Complications	0.242

Logistic Regression Analysis:
Dependent Variable - OUTCOME
* Significant p-value, i.e. <0.05

Results

The records of 62 children, 20 males and 42 females (M: F = 1:2.1). This represented 38.5% of all the patients seen during the study period. Their ages ranged between 0.1 to 13 years (mean age = 4.8 ± 3.8 years). Children aged 4 years and below represented 56.5% of the cases.

The %TBSA burnt ranged from 1 to 95% (mean = 29.7% ± 22.8%). Major burn (burn %TBSA = 30%), occurred in 41.9% (26) of the patients. The mean TBSA burnt was 25.3% in children aged 4years and below, and 38.6% in the older children.

The most common aetiological agents responsible for the burns injuries included flame in 35 (56.5%) patients, moist heat (scald) in 24 (38.7%). Inhalation injury occurred in 27 (43.5%) patients (Table 1). The majority (88.7%) of the thermal injuries were due to domestic mishaps (Table 2). Out of the 27 patients who sustained inhalation injury, 16 (59.3%) were intubated prophylactically to prevent airway obstruction. The incidence of inhalation injury was 40.0% in those children aged 4 yeares and below and 44.0% in the older children.

Infective complications occurred in 23 (37.1%) the patients and it was mostly burn wound infection. The overall mortality rate was 33.9%. The mortality rate was 62.9% and 11.4% in those with and without inhalation injury, respectively. The mortality rate was 28.6% in children aged 4 years and below 40.7% in those older than 4 years.

Logistic regression analyses showed that %TBSA burnt (P = 0.000) and the presence of inhalation injury (P = 0.003) were significant predictors of death, but age, sex, and aetiology were not (P = 0.369, P = 0.571 and P = 0.68 respectively) Table 3.

Discussion

One of the main findings in this study is that the mortality rate was less in children aged 4 years and below compared with the older children. This lower mortality rate may be attributable to a lower incidence of inhalation injury (40% vs. 44%) and lower mean %TBSA burnt in the children aged 4 years and below as compared with those older than 4 years (25.3% vs. 38.6%). The reasons for these differences in incidence are unclear. The lower mortality rate in this study contrasts with an earlier report in which age 4 years and below (except for inhalation injury and %TBSA

Copyright © 2007 African Journal of Paediatric Surgery

>30%) was as an independent risk factor for mortality in paediatric burns[3].

Burn size was the most significant predictive factor for mortality in this study as in many other reports[2,3,10]. In young children, burn size greater than 30% is the point at which the mortality rate increases significantly[10]. The importance of burn size in determining the chances of survival is reflected in the difference in mean %TBSA burnt in non - survivors and survivors (48.8% versus 17.5%) in this study. A high %TBSA burnt (about 30%) reflects the severity of the injury was reflected by the mortality rate associated with a %TBSA of 30% or more in this study. Most of the patients in this study with large surface area burned survived the initial resuscitation period only to die afterwards from infection and multiple organ failure. This is probably as a result of delay in burn wound coverage that predisposes to infection with the elaboration of exotoxin which potentiates the already high levels of circulating cytokines, arachidonic acid metabolites and oxidants. Early skin cover and improved respiratory care is largely responsible for the much-improved survival in the developed world[11]. Despite the fact that the policy at our centre is to achieve primary wound cover immediately after resuscitation, economic, social, logistic, and infra-structural reasons have made this virtually impossible.

The incidence of inhalation injury in this study is quite high compared to a lower incidence of 12.2% in a previous study[3]. A previous review on inhalation injury carried out at our center on all age categories showed an incidence of inhalation injury of 16%[12]. The incidence of inhalation injury in this report may have been over or underestimated as the tools of bronchoscopy and pulmonary ventilation/ perfusion scan were not available during the period of the study. The diagnosis of inhalation injury was, therefore, based on clinical parameters only. The mortality rate of 63% following inhalation injury in the present study compares with the 19% to 84% in other reports[13,14].

The female preponderance in this stud is at variance with many reports[1,3,10], but is in agreement with the report by Kumar[15]. The reason for the female dominance may be related to their involvement in the use of kerosene (commonly used for cooking in the kitchen). Kerosine explosion was the most common cause of burn injury during this study. However the sex was not found to be a predictor of mortality.

Flame was the most common cause of burn injury (56.4%) in this report followed by scald (35.8%). Although this contrasts with some studies[16,17] in which scald is a commoner aetiological agent of burns in children, the present data compare well with those in a previous study at our center[18], and may reflect the peculiarity of our study population. However, we did not find aetiology as a predictor of outcome.

Most of the injuries occurred at home from circumstances that were largely avoidable. Many occurred while re-fueling a lit kerosene lantern or stove; others were from ignition of clothing by lit candles. Kerosene lanterns and candles are alternative sources of light during frequent electric power outages in our environment and kerosene stoves are used by majority of households for cooking. Ignition of clothing is the second leading cause of burn admissions for most ages[19]. According to Pruitt[20], the burn injury rate due to the ignition of clothing is influenced by poverty and is inversely related to income.

The overall mortality rate of 34% is quite high. A

Copyright © 2007 African Journal of Paediatric Surgery

Signes annonciateurs de mortalité dans les brûlures pédiatriques à Ibadan, Nigeria

Résumé

Arrière-plan: La brûlure constitue une cause majeure de morbidité et de mortalité liées au traumatisme. L'amélioration des soins prodigués aux victimes de brûlure a considérablement réduit la mortalité. Cette étude avait pour objectif de déterminer le résultat et la gestion des brûlures chez les enfants. ***Malades et méthodes:*** Il s'agit d'une étude prospective d'enfants âgés de 0 à 13 ans, soignés dans l'unité des brûlures au Collège hospitalo-universitaire d'Ibadan au Nigeria entre janvier 2001 et septembre 2003. ***Résultats:*** Il y avait 62 malades, dont 42 (67,7%) fillettes et 20 (32,3%) garçonnets (Garçon : Fille = 1:2). Ils étaient âgés d'un mois à 13 ans (moyenne = 4.8 ± 3.8 années). La majorité des malades (56,5%) avaient moins de 4 ans. La brûlure a été causée d'une manière prédominante par la flamme (57%), et 43,5% des malades ont souffert l'inhalation. Le pourcentage de la surface brûlée (% SB) était entre 1% et 95% (moyenne 29,7% ± 22,8%), et 41,4% des malades ont reçu une brûlure majeure (SB 30%). Les complications infectieuses étaient présentes chez 37% des malades. La mortalité totale était de 33,9%, ce qui s'est produit chez les malades ayant une surface brûlée de 14 à 95% (moyenne = 48,8%). Le taux de la mortalité était de 62,9% parmi ceux qui avaient subi l'inhalation contre 11,4% chez ceux sans blessure d'inhalation. Il n'y avait aucune mortalité chez les malades dont la surface brûlée était entre 1% et 32% (moyenne = 17,5%). ***Conclusion:*** Le pourcentage de la surface du corps brûlé et la présence de blessures d'inhalation sont d'importants signes annonciateurs de mortalité chez les enfants brûlés. ***Mots-clés:*** Brûlures, enfants, mortalité

References

1 Olabanji JK, Oginni FO, Bankole JO, Olasinde AA. A ten year review of burn cases seen in a Nigerian teaching hospital. J Burn & Surg Wound Care [serial online] 2003; 2:1. Available from: URL: http://www.journalofburns.com

2. Sharma PN, Bang RL, Al-Fadhli AN, et al. Paediatric Burns in Kuwait: Incidence, causes and mortality. Burns 2006; 32: 104 111.
3. Morrow SE, Smith DL, Cairns BA, et al. Etiology and outcome of pediatric burns. J Pediatr Surg. 1996; 31: 329-333
4. Thompson PB, Herndon DN, Traber DL, et al. Effect on mortality of inhalation injury. J Trauma. 1986; 26: 163-165.
5. Feller I, Tholen D, Cornell RG. Improvements in burn care, 1965 to 1979. JAMA. 1980; 244: 2074-2090
6. Merrell SW, Saffle JR, Sullivan JJ, et al. Increased survival after major thermal injury. Am J Surg. 1987; 154:623-627
7. Ireton-Jones CS, Baxter CR. Nutrition for adult burn patients: a review. Nutrition in Clinical Practice. 1991; 6: 3-7
8. Waymack PJ, Herndon DN. Nutrition support of the burned patient. World J Surg. 1992: 16: 80-86
9. Tompkins RG, Remensnyder JP, Burke JF, et al. Significant reductions in mortality for children with burn injuries through the use of prompt eschar excision. Ann Surg. 1998; 208: 577-585
10. Erickson EJ, Merrell SW, Saffle JR, et al. Differences in mortality from thermal injury between pediatric and adult patients. J Pediatr Surg. 1991; 26: 821-825
11. Sheridan RL, Remensnyder JP, Schnitzer JJ, et al. Current expectations for survival in pediatric burn. Arch Pediatr Adolesc Med 2000 March; 154:245-249.
12. Adigun IO, Oluwatosin OM, Amanor Boadu SD, Oluwole OA. Inhalation injury in burn patients in Ibadan. The Nigerian Journal of Surgical Research. 2001; 3: 50-55
13. Herndon DN, Thompson PB, Linares HA, Traber Postgraduate course: Respiratory injury. JBCR.1986; 7: 185-190
14. Nottet JB, Duruisseau O, Herve S, et al. Inhalation burns: apropos of 198 cases. Incidence of laryngotracheal involvement (French). Ann d Oto-Laryngology et de Chirurgie Cervico-Faciale. 1997; 114: 220-225.
15. Kumar P, Chirayil PT, Chittoria R. Ten year epidemiological study of paediatric burns in Manipal, India. Burns. 2000; 26: 261-264.
16. Uba AF, Edino ST, Yakubu AA. Paediatric Burns: Management problems in a teaching hospital in Northwestern Nigeria. Tropical Doctor. 2007; 37: 114-115.
17. Bessey PQ, Arons RR, DiMaggio CJ, Yurt RW. The vulnerabilities of age: Burns in children and older adults. Surgery. 2006; 140: 705-717.
18. Fasika OM. Changing pattern of burn epidemiology and the compliance factor in management at Ibadan. The Nigerian Postgraduate Medical Journal. 1997; 4: 7-10
19. Baker SP, O'Neill B, Karpf RS. The injury fact book, Lexington, MA: Lexington Books, 1984: 139-154
20. Pruitt Jr BA, Mason Jr AD. Epidemiological, demographic, and outcome analysis of burn injury. In: Herndon DN, editor. Total burn care. 1st edition. Philadelphia, PA: Saunders; 1996; p. 5-15
21. McLoughlin E, McGuire A. The causes, cost, and prevention of childhood burn injuries. Am J Dis Child. 1990; 144: 677-

Copyright © 2007 African Journal of Paediatric Surgery