

Burn with Mortality in Children: A Retrospective studyEhmer-Al-Ibran¹ and Syeda Hina Rizvi²**ABSTRACT**

Objective: A Retrospective study has been devised to study the risk factors associated with the burns patients and to determine the potential complications experienced by those patients.

Study Design: Retrospective study.

Place and Duration of Study: This study was conducted at the Burns Centre, Civil Hospital Karachi from 1st January 2015-30th September 2015.

Materials and Methods: A total of 227 patients have been employed in the study. Purposeful sampling has been used to select the sample size for the specific study. The data collection procedure for the study was completed within 9 months. Children specifically from Karachi city from birth till 12 years have been entailed in the study.

Results: With the exception of 1 suicidal cause of burn, the rest 226 were accidental in nature. Only 3.1% (7) patients burnt outdoor, 0.4% (1) burnt on a ship whereas 96 % (218) patients were burnt indoors. Amongst the total admissions 89% (202) had 10-50% total body surface area burnt (being the most common category), whereas 9.7% (22) had <10% TBSA burnt while only 1.3% (3) had >50% TBSA burnt. The percentage of TBSA burnt is significantly associated with mortality (p=0.003), with 92% (59) deaths having TBSA 10-50%.

Conclusion: TBSA% is most important single predictor for mortality among children with burn.

Key Words: Risk Factors, Burn, Mortality, Children

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INTRODUCTION

According to the literature reviewed, risk factors leading to mortality in a burn victim have been reported in studies conducted worldwide. Inhalational injury¹⁻⁴ TBSA>60%,² burn degree,⁵ the age of the patient,⁶ location of wound⁷ in pediatric burn victims affects the final outcome and are related with increased mortality. Death was reported due to severe pneumonia and septicemia following burn injury.⁸

First aid measures at the site of accident contribute significantly to reducing mortality. Late presentation to health facilities, lack of well-equipped burn centers and trained medical personnel and non-existing early excision and skin grafting contributes significantly to increasing morbidity and mortality.³ Inadequate public education, injury prevention and control measures and ineffective ambulance system for transportation of burned patients to specialized burn centers are important factors responsible for most of the deaths in cases of critical burns.³

Wound sepsis also contributes significantly to high mortality among burn injury patients where multi-drug resistant organisms causing significantly higher mortality.⁷ Studies conducted in Pakistan show that there is highest mortality among children more than six year and least in age group between 3 - 6 years.⁹ There is a need for more research in Pakistan to quest the combined effect of factors that leads to mortality in pediatric burn victims. Thereby, efforts can be made to prevent and minimize such factors and to modify the initial management accordingly.

It will be the first study conducted in Burns Unit of Civil Hospital Karachi (CHK) that will establish the factors responsible for mortality in pediatric Burn patients. By determining the variables, efforts can be made to improve preventive measures and aware general population to minimize/control such factors and the potential complications and hence mortality in a burn victim. The study has aimed to enlarge the understanding of risk factors associated with mortality in Burns Unit of CHK. The efforts made in the comprehension of risk factors have been effective in controlling these factors, likelihood complications and mortality in a pediatric burn victim.

MATERIALS AND METHODS

A Retrospective study has been devised to study the risk factors associated with the burns patients and to determine the potential complications experienced by those patients. In this regards, Civil hospital Karachi (CHK) is selected to carry forward the study.

¹. Department of Burns Centre, Civil Hospital Karachi.

². Department of Respiratory and Critical Care Technology, DIMC, DUHS, Karachi.

Correspondence: Syeda Hina Rizvi, Instructor Respiratory and Critical Care Technology, Dow Institute of Medical Technology, Dow University of Health Sciences, Karachi.

Contact No: 0300-2937470

Email: Hina.rizvi@duhs.edu.pk

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Furthermore, patients admitted in the pediatric burn unit have been included into the study for investigation. A total of 227 patients have been employed in the study. Purposeful sampling has been used to select the sample size for the specific study. The data collection procedure for the study was completed within 9 months (1st January 2015-30th September 2015). Children specifically from Karachi city from birth till 12 years have been entailed in the study. Furthermore, the focus of this study is to include children with diseases rather than congenital anomalies, epilepsy, asthma and malignancies. Children greater than 12 years and from other cities of province Sindh will be excluded from the study.

The data collection procedure has been completed through implementing self-administered questionnaire, which include items related to patient's age, sex, cause of injury, type of injury, total body surface area (TBSA), nutritional status (total protein) and other variables. Records of patients will be obtained after taking permission from Burn Centre, Civil Hospital Karachi. Patients were employed in the study in accordance to the specified inclusion criteria.

Questionnaires were filled by the investigators using the provided records. The statistical package for the social sciences (SPSS) was used to conduct the statistical analysis for the specific study. The illustration of categorical variables was represented in the form of frequencies and percentages. Central tendency measures were used to compute the continuous variables. Moreover, categorical variables such as gender, mortality were analyzed through chi-square test and descriptive frequencies. The data will only be used by the assigned researchers. All data will be kept confidential and solely be utilized for research purpose only.

RESULTS

The results have shown that the total number of admissions were 227 with 59.5% (135) males and 40.5% (92) females with a mean age of 4.8 (SD 3.3 years). Mortality has been considered to be the major concern in the age group ranging from 1-5 years. Patients aged 2 year were at highest risk constituting about 15 % (34) admissions. Mean Duration of hospital stay was 10.6 days (SD 1.1 days). The results have also depicted that scald was the most common type of burn occurring in 139 (61.2%) of the patients, followed by fire burns 77 (33.9%), electrical burns 7 (3.1%) while chemical burn was the least common with only 4 (1.8%) patients reported chemical burn injury.

With the exception of 1 suicidal cause of burn, the rest 226 were accidental in nature. Only 3.1% (7) patients burnt outdoor, 0.4% (1) burnt on a ship whereas 96 % (218) patients were burnt indoors. Amongst the total admissions 89% (202) had 10-50% total body surface area burnt (being the most common category), whereas

9.7% (22) had <10% TBSA burnt while only 1.3% (3) had >50% TBSA burnt. The percentage of TBSA burnt is significantly associated with mortality (p=0.003), with 92% (59) deaths having TBSA 10-50%.

Table No.1: Table Showing the Region of Burns and With the Region of Burn

Region of burns	Admissions n (%) Total =227	Deaths n (%) Total =64
Head and neck	11 (4.8)	1(1.5)
Trunk	20(8.8)	3(4.6)
Upper limbs	15(6.6)	2(3.1)
Lower limbs	19(8.4)	2(3.1)
Buttocks and genitalia	6(2.6)	0(0)
Multiple	156(68.7)	56(87.5)

Table No.2: Percentage of Total Body Surface Area Burnt and Mortality associated with Severity of Burns.

% TBSA	Admission n(%) Total= 227	Death n(%) Total=64
01-10	22(9.7)	2(3)
11-50	202(89)	59(92.1)
51-100	3(1.3)	3(4.6)

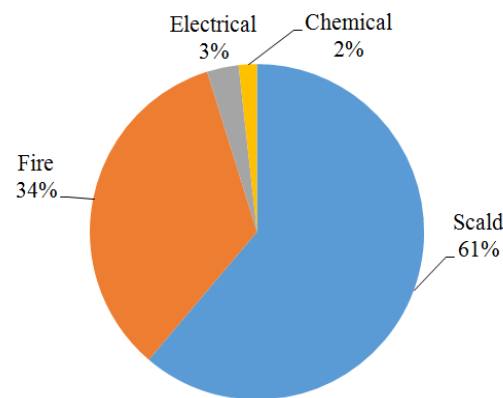


Figure No.1: Type of burns presented to burns ward

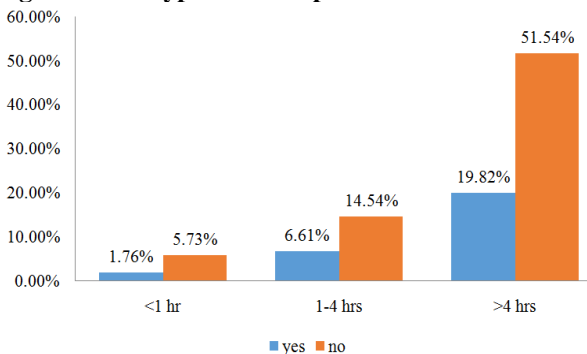


Figure No.2: Comparison showing length of time to IV access and the % of mortality

DISCUSSION

Mortality due to burn among pediatric population is serious complication and data about associated predictors of burn mortality is still scares.^{10, 11} Studies predict that mortality among pediatric burn patient ranges from 4-12% and is significantly associated with age and multiple organ failure due to burn complications.¹⁰ Fungal infection is an important cause of morbidity and mortality among burn patients.¹² Aim of this study was to rule out the factors associated with burn mortality among children admitted to CHK and plan the interventions to improve burn survival. According to our findings TBSA%, time to IV access post-burn and type of burn are significantly associated with burn mortality among children.

Most of the times burn victims lose their lives because of shocks (hypovolemic, septic etc) in initial hour of event, respiratory distress which is secondary to inhalation syndrome usually and multiple organ failure which is due to either extension or depth of wounds.¹² On the other hand infections are most prevalent cause of death among burn victims post-burn¹³ Pediatric population is susceptible for infections and related complications.^{14,15} Moreover loss of skin, low immunity and over the counter or misuse of antibiotics can be risk factors behind severe complications of infection among children with burn.¹⁶ In our study, out of 227 patients more than half were males. However, gender was not significantly related to burn mortality among pediatric population, which is significant with findings of Rehmani et al.¹⁷

Age is most significant factor related to mortality among children with burn, specifically age less than three years, is congruent with our study findings which determines most of admissions of burn at age 2 years.^{18, 19} One of the study from Ankara,²⁰ out of the patients under the age of 7 years, majority of subjects were found to be under age 3 years which is subsequent to study findings. It is recommended that this age group is more vulnerable and susceptible; there is need to provide training programs for parents, as ignorance or lack of awareness is huge factor behind this loss.¹⁷

According to our study, almost 96% burn cases took place at home. Shekter et al from Brazil reported, among children under age 13 years 86 percent burns happened at home,²¹ similarly one study pointed this percentage to be 94 % under age 5 years which is consistent with our findings.²² On the contrast, one of study reported that high association of outdoor playing with high number of burns were explained by least control of parents which was inconsistent with our study findings.²³ Literature was not indicated the implications of outdoor activities with burn much.

Our study indicated that majority of burns happened from scald which is consistent with study findings from Ankara and other regions which reported most injuries

caused by hot liquids (74.5%).^{24, 25} Isaac et al from south Africa reported, boiled water to be main reason for type of burn,²⁶ in one study by Arslan et al,²⁷ also reported same finding. On the contrary, studies also reported positive association between cause of burn and mortality. However, flame burn victims die more as compared to scald burns which is need to be explored in our settings as well.^{31, 32}

Nevertheless one more study suggested contrast finding to our findings that majority of times death occurred among fire burns, which is highly associated with parenting habits like leaving children supervised or unsupervised.²⁸ Wehdati et al. in one study reported, most of time, among young and adolescents patient lower limbs burns are resulted from boiling water or liquids at home.²⁹

According to our findings, 2 deaths occurred among 22 mild burn covering less than 10% of TBSA%. However, 56 deaths out of total 64 were associated with TBSA% between 11-50% and 100% deaths for TBSA% > 50% which is consistent with other study findings which reported the increase number of deaths with higher percentage of TBSA% involved.^{24, 30} Another study from Kuwait reported that TBSA% is most critical factor associated with burn mortality among children and adults both patients coming with burns or end up into irreversible complications.³³ Our study points out that with every hour delay in IV access death number increases and it is above 50% if IV access has been delayed for more than 4 hours. With excessive fluid loss, skin loss and burn injuries, IV access the first key step to save the lives.³⁴ Studies indicate that patients who receive early fluid resuscitation and adequate in terms of management face lesser complications.³⁵ Another study from Indonesia reported that burn survival can be increased; mortality can be declined by providing early resuscitation and IV access which is consistent with our study.

Sever burn is given more importance although and literature provides evidences about its complications. However, more explorations are needed for risk factors of moderate and mild burns among children.³⁶ As per burn types risk factors may be different, which need to be studied precisely; for example, mortality according to types of clothes victim was wearing and environment of victims etc. In further to previous studies, we also observed risk factor for burn mortality as whole. We recommend that risk factors of burn mortality among children according to type of injury and burn mechanism should be investigated.

We also propose referral facilities for burn patients with updating knowledge of nurse and physicians regularly. Active communications are also suggested to improvise coordination and collaboration among health care team members. Lastly, burn should be treated as a separate medical specialty in health care setting to benchmark standards of burn care. Emergency triage assessment,

early management of burn victims management and fluid resuscitation guidelines are needed to be developed to prevent mortalities by avoiding delay in care of burn victims.³⁵

One of the limitations associated with our study is that we couldn't perform sub group analysis to predict the risk factors in types of burn individually or as per age or gender. Thus, it was not put the results of study at risk and compromised generalizability of study if proposed for same set of population. We conducted study as per protocol and objectives decided. Strength of our study is that we addressed main predictors of burn mortality among children.

CONCLUSION

TBSA% is most important single predictor for mortality among children with burn. Early access to fluid resuscitation is one of the most important survival predictor for burn victims, furthermore appropriate management of associated complications and proper nutritional support are important measures that should be considered at first to improve the survival and provide better management of burn.

Author's Contribution:

Concept & Design of Ehmer-Al-Ibran Study:

Drafting: Syeda Hina Rizvi

Data Analysis: Syeda Hina Rizvi

Revisiting Critically: Ehmer-Al-Ibran

Final Approval of version: Ehmer-Al-Ibran

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. Agbenorku P, Agbenorku M, Fiifi-Yankson PK. Pediatric burns mortality risk factors in a developing country's tertiary burns intensive care unit. *Int J Burns Trauma* 2013;3:151.
2. Kraft R, Herndon DN, Al-Mousawi AM, Williams FN, Finnerty CC, Jeschke MG, et al. Burn size and survival probability in paediatric patients in modern burn care: a prospective observational cohort study. *Lancet* 2012;379:1013-21.
3. Chalya PL, Mabula JB, Dass RM, Giiti G, Chandika AB, Kanumba ES, et al. Pattern of childhood burn injuries and their management outcome at Bugando Medical Centre in Northwestern Tanzania. *BMC Res Notes* 2011;4: 485.
4. Karimi H, Motevalian SA, Rabbani AH, Motabar AR, Vasigh M, Sabzeparvar M, et al. Prediction of mortality in pediatric burn injuries: R-baux score to be applied in children (pediatrics-baux score). *Iranian J Pediatr* 2013; 23:165-70.
5. Neriman Akansel RN, LpnSY, Kahveci R. Etiology of burn injuries among 0-6 aged children in one University Hospital Burn Unit, Bursa, Turkey. *Int J Caring Sci* 2013; 6:207-208.
6. Yavuz A, Ayse A, Abdullah A, Belkiz A. Clinical and demographic features of pediatric burns in the eastern provinces of Turkey. *Scandinavian J Trauma, Resuscitation Emerg Med* 2011;19:5-6.
7. Michael H. Toon, Dirk M. Maybauer, Lisa L. Arceneaux, John F. Fraser, Walter Meyer, Antoinette Runge, et al. Children with burn injuries-assessment of trauma, neglect, violence and abuse. *J Injury Violence Res* 2011; 3:98.
8. Okoro PE, Igwe PO, Ukachukwu AK. Childhood burns in south eastern Nigeria. *Afri J Pediatr Surg* 2009; 6:24.
9. Tirmizi SZA. Pattern of Burn Injuries and Outcome in Children. *J Dow Uni Health Sci* 2013; 7:23-24.
10. Bloemsma GC, Dokter J, Boxma H, Oen IM. Mortality and causes of death in a burn centre. *Burns* 2008; 34: 1103-1107.
11. Lumenta DB, Hautier A, Desouches C, Gouvernet J, Giorgi R, Manelli JC, et al. Mortality and morbidity among elderly people with burns-evaluation of data on admission. *Burns* 2008; 34:965-974.
12. Dhopte A, Tiwari VK, Patel P, Bamaal R. Epidemiology of pediatric burns and future prevention strategies-a study of 475 patients from a high-volume burn center in North India. *Burns Trauma* 2017; 5:1.
13. Capoor MR, Sarabahi S, Tiwari VK, Narayanan RP. Fungal infections in burns: Diagnosis and management. *Ind J Plastic Surg* 2010; 43:36-37.
14. Nelson RE, Schweizer ML, Perencevich EN, Nelson SD. Costs and mortality associated with multidrug-resistant healthcare-associated Acinetobacter infections. *Infection control & hospital. Epidemiol* 2016;37:1-7.
15. Ortiz-Prado EL, Armijos AL. Iturralde. A population-based study of the epidemiology of acute adult burns in Ecuador from 2005 to 2014. *Burns* 2015; 41: 582-589.
16. Tyson AF, Boschini LP, Kiser MM, Samuel JC, Mjuweni SN, Cairns BA, et al. Survival after burn in a sub-Saharan burn unit: Challenges and opportunities. *Burns* 2013; 39:1619-1625.
17. Rahmani R, Bakhtavar HE, Zamani A, Abdollahi F, Rahmani F. Demographic features of pediatric patients with burn injuries referred to the emergency department of Sina hospital in Tabriz, Iran, in 2014. *J Analytical Res Clin Med* 2017; 5:51-53.
18. Goldstein B, Giroir A. Randolph. International pediatric sepsis consensus conference: definitions

- for sepsis and organ dysfunction in pediatrics. *Pediatr Cri Care Med* 2005;6:2-8.
19. Macedo JLSD, Santos JOB. Predictive factors of mortality in burn patients. *Revista do Instituto de Medicina. Tropical de Saeo Paulo* 2007;49: 365-370.
 20. Aksoy NN, Arli S, Yigit O. A retrospective analysis of the burn injury patients records in the emergency department, an epidemiologic study. *Emergency-An Academic Emergency Med J* 2014; 2:115-120.
 21. Shekter CC, Van Vliet MM, Krishnan NM, Garner WL. Cost-effectiveness comparison between topical silver sulfadiazine and enclosed silver dressing for partial-thickness burn treatment. *J Burn Care Res* 2014; 35:284-290.
 22. Karami Matin B, Rezaei S. Epidemiological Analysis and Cost of Hospitalization Associated with Pediatric Burns in Kermanshah, Iran. *Int J Pediatr* 2014; 2:369-376.
 23. Bazargani HS, Mohammadi R, Amiri S, Syedi N, Tabrizi A, Irandoost P, et al. Individual-level predictors of inpatient childhood burn injuries: a case control study. *BMC Public Health* 2016; 16: 209.
 24. Burd A, Yuen C. A global study of hospitalized paediatric burn patients. *Burns* 2005;31:432-438.
 25. Golshan A, Patel C, Hyder AA, et al. A systematic review of the epidemiology of unintentional burn injuries in South Asia. *J Public Health* 2013; 35:101-102.
 26. Isaac KN, Van Niekerk A, Van As AB. Child road traffic crash injuries at the Red Cross War Memorial Children's Hospital in Cape Town, South Africa in 1992, 2002 and 2012. *Int J Injury Control Safety Promotion* 2015;22: 352-358.
 27. Arslan H, Kul B, Derebaşınlioğlu H, Çetinkale O. Epidemiology of pediatric burn injuries in Istanbul, Turkey. *Turk J Trauma Emerg* 2013;19: 123-126.
 28. Klein MB, Goverman J, Hayden DL, Fagan SP, McDonald-Smith GP, Alexander AK, et al. Benchmarking outcomes in the critically injured burn patient. *Annals Surg* 2014;259: 831-833.
 29. Vahdati SS, Karzar BH, Momen N. Independent predictive factors of hospitalization in a North-West Burn Center of Iran; An epidemiologic study. *Emerg* 2015; 3:40-43.
 30. Gupta S, et al. Burns in Nepal: a population based national assessment. *Burns* 2015; 41:1126-1132.
 31. Khaliq MF, Noorani MM, Siddiqui UA, Al Ibran E, Rao MH. Factors associated with duration of hospitalization and outcome in burns patients: A cross sectional study from Government Tertiary Care Hospital in Karachi, Pakistan. *Burns* 2013; 39:150-154.
 32. Al Ibran E, Mirza FH, Memon AA, Farooq MZ, Hassan M. Mortality associated with burn injury-a cross sectional study from Karachi, Pakistan. *BMC Research Notes* 2013; 6: 541-545.
 33. Ebrahimi M, Sohrabi MB, Zolfaghari P, Yahyaei E, Kheslat NN, Shariati Z, et al. Outcomes and Risk Factors Associated with Burn Injuries in Children. *Int J Health Studies* 2016;2:97-99.
 34. Klein MB, Hayden D, Elson C, Nathens AB, Gamelli RL, Gibran NS, et al. The association between fluid administration and outcome following major burn: a multicenter study. *Annals Surg* 2007; 245:622-628.
 35. Nurliati Sari H, Wardhana A. Early Burn Resuscitation Done By Referring Facilities and Burn Patients Survival: A Retrospective Study. *ISJD* 2012; 1:11-17.
 36. Gupta S, Wong EG, Mahmood U, Charles AG, Nwomeh BC, Kushner AL. Burn management capacity in low and middle-income countries: A systematic review of 458 hospitals across 14 countries. *Int J Surg* 2014; 12:1070-1073.