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Impact of Referral Timing on Mortality Rates in Burn Patients: A Comparison of Urgent vs. Delayed Hospital Admission

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ABSTRACT

Background: Burn injuries pose a significant global health challenge, with lasting complications that affect patients throughout their lives. Mortality rates are notably higher among older individuals, those with extensive burn injuries and patients suffering from inhalation injuries. Given the critical nature of these issues, we aimed to investigate the factors contributing to mortality in burn patients.

Methods: We analyzed data from 1,935 burn patients treated between Mar 2020 and Mar 2023. Comprehensive demographic information, burn severity and treatment details were extracted from the patients' medical records and were compiled using Excel software for statistical analysis.

Results: Among burn patients studied, 1,214 (62.73%) were male, while 721 (37%) were female. The mortality rate for patients admitted urgently to the hospital was 9.63%, compared to 12.46% for those who experienced delayed admission. This discrepancy highlights that delayed hospital admission is linked to a 2.83% increase in the risk of mortality.

Conclusion: Timely admission is crucial in reducing mortality rates among burn patients. Early intervention can decrease the mortality rate by 2.83%, highlighting the importance of prompt medical attention in improving patient outcomes.

Keywords: Burn injuries, Inhalation injury, Emergency care, Afghanistan

Introduction

Burn injuries represent a significant public health challenge globally, accounting for an estimated 265,000 deaths annually due to fires alone (1). Survivors of burn injuries may experience a wide range of physical and psychological outcomes, which largely depend on the severity of the burns (2). The leading causes of death among burn patients include sepsis, inhalation injury, and multi-organ failure. Various demographic and injury-related factors, such as age, gender, the extent of burns, and the presence of inhalation injuries, have been utilized to predict mortality following severe burns.

In developed countries, burn injuries result in over 50,000 hospital admissions each year, with a mortality rate ranging from 5% to 6%. However, when accompanied by inhalation injuries, the death rate can exceed 30% (3). The risk of fatality increases by 400% in cases involving inhalation injuries (4). Mortality rates differ between genders, with women experiencing a death rate of 35.9% compared to 18.4% for men (5). In South

Korea, the annual incidence of fire accidents rose from 31,372 in 2003 to 49,631 in 2008, then declined to 47,318 in 2012 and further to 41,868 in 2013 (6). In the Eastern Mediterranean Region (EMR), which includes 22 countries from Morocco to Afghanistan, burn injuries are a major public health concern (7). In North India, the estimated mean cost per patient, which includes social and labor costs, can reach as high as US $1,060 for treating burn victims (8).

Recent studies have highlighted the effectiveness of heparin combined with N-acetyl cysteine in reducing mortality rates among burn patients (9). Early intervention through resuscitation, ventilation, and grafting has also been shown to decrease mortality from severe burn injuries (10). The application of cadaver skin allograft within three days post-burn could significantly reduce mortality rates in affected patients (11). Over the past three decades, there has been a notable 2% annual reduction in mortality rates among burn patients (12). Moreover, total body surface area (TBSA) and age-adjusted mortality rates indicate that higher age (13) larger burn areas, fungal presence in wounds, shorter hospital stays, and the presence of multi-resistant bacteria are significant predictors of increased mortality (14). The mortality rate in older adult burn patients is reported to be 17.3% (15). Excess mortality is particularly high among patients initially treated for intentional carbon monoxide poisoning (9). The presence of inhalation injuries, whether alone or concurrent with pneumonia, could increase burn-related mortality by 20% to 60% (16). Despite advancements in cutaneous burn management, progress in developing specific therapies for inhalation injuries remains limited (17).

We aimed to investigate the impact of timing on mortality rates among burn patients referred to the Plastic and Burn Surgery Department at Esteghlal Hospital in Kabul, Afghanistan between 2020 and 2023.

Material and Methods

This retrospective cross-sectional study included patients admitted to the Plastic and Burn Surgery Center at Esteqlal Hospital, the only facility of its kind in Afghanistan, serving individuals from all 34 provinces and providing specialized plastic and burn surgery services. The study involved a thorough examination of patients' medical records to extract pertinent demographic information and data related to burn severity. Informed consent was obtained from all participants, ensuring that they were fully aware of their involvement in the study and the potential use of their medical information for research purposes. Ethical and administrative approvals were secured from the Plastic and Burn Surgery Department at Esteqlal Hospital, ensuring that the study adhered to ethical standards and institutional guidelines. Additionally, the study protocol was formally registered on Oct 1, 2024, to maintain transparency and accountability in the research process. To protect patient confidentiality, the study was designed to exclude any identifiable personal information from the data collection process.

Overall, 1,935 patients were selected from a three-year period, from Mar 2020 to Mar 2023. The selection criteria focused on the completeness and accuracy of medical records, ensuring that only records free from discrepancies were included. This attention to detail was crucial for the integrity of the study's findings. The data gathered from the medical records included several critical variables: age, gender, TBSA affected by burns, inhalation injury status, and admission timing (categorized as early or delayed). TBSA was calculated using established methods, including the Rule of Nines, Lund-Browder Chart, and the Palmar Method, all

of which are standard practices in burn care that help assess the severity of burns and guide treatment. In terms of clinical management, inhalation injuries were treated with 100% oxygen therapy, which is essential for patients experiencing respiratory distress due to smoke inhalation. Rather than using the combination of heparin and N-acetyl cysteine, which is common in some protocols, the study employed hydrocortisone for 2 days post-burn to reduce effectively respiratory edema, highlighting a tailored approach to treatment based on the available resources and clinical practices.

For the purposes of this study, "early admission" was defined as occurring within 1 to 4 h after the burn incident, while "delayed admission" was categorized as occurring between 5 to 24 h post-burn. Data analysis was conducted using Excel software, which facilitated the organization and statistical examination of the collected information. This analysis aimed to uncover trends and correlations that could inform future clinical practices and improve patient care in burn management.

Results

Overall, 1,935 burn patients were analyzed, comprising 1,214 males (62.73%) and 721 females (37%). Among the patients admitted urgently, which constituted 716 individuals (37%), the overall mortality rate was 9.63%. In contrast, the 1,219 patients (62.99%) presenting with delayed admissions experienced a significantly higher mortality rate of 12.46%, indicating that the mortality risk for late arrivals was 2.83% greater than for those admitted urgently. Focusing on age-specific mortality rates among urgently admitted patients, the cohort included 380 males and 185 females. In the 15–30-year age group, comprising 209 males and 185 females, mortality rates were recorded at 3.82% (8 deaths) for males and 3.78% (7 deaths) for females. In the 30–45-year age group, 76 males and 67 females exhibited mortality rates of 9.21% (7 deaths) and 8.92% (6 deaths), respectively. The mortality rates escalated in the 45–60-year age bracket, with 17.54% (10 deaths) for 57 males and 23.52% (12 deaths) for 51 females. Among patients aged 60 and older, mortality rates reached 26.31% (10 deaths) for 38 males and 27.27% (9 deaths) for 33 females.

Of the 716 patients admitted urgently, 281 had inhalation injuries, resulting in a mortality rate of 16% (45 deaths). Conversely, the 435 patients without inhalation injuries had a significantly lower mortality rate of 5.51% (24 deaths) (P<0.05). Regarding TBSA for patients admitted urgently, out of the 716 patients, 438 had burns covering 20-40% TBSA, with a mortality rate of 2.51% (11 deaths). For those with 40%-50% TBSA, the mortality rate rose to 6.49% (15 deaths). Alarmingly, patients with burns covering 60% TBSA or more faced a mortality rate of 91.48% (43 deaths) (Table 1).

In the analysis of delayed admissions, among the 1,214 patients, there were 829 males and 385 females. In the 15–30-year age group, 311 males and 141 females were admitted, with mortality rates of 8.03% (25 deaths) for males and 8.51% (12 deaths) for females. The 30-45 year age group included 270 males and 119 females, with mortality rates of 9.62% (26 deaths) and 9.24% (11 deaths), respectively. In the 45-60 year category, 165 males and 86 females had mortality rates of 17.57% (29 deaths) and 13.95% (12 deaths). Among those aged 60 and older, 83 males had a mortality rate of 28.91% (24 deaths), while 39 females experienced a mortality rate of 33.33% (13 deaths). Among the 1,219 patients admitted with delayed presentations, 370 had inhalation injuries, resulting in a mortality rate of 22.7% (84 deaths). In contrast, the mortality rate for the 844 patients without inhalation injuries was lower at 8.05% (68 deaths).

Table 1: Mortality Rate among Burn Patients Admitted Urgently

Urgently admission	***Description***	***n= 716 (%)***	***Mortality N(%)***
Gender	Male	380 (53.08)	35 (9.21)
	Female	336 (46.92)	34 (10.11)
Age(yr)	15-30	394 (55.02)	15 (3.80)
	31-45	143 (19.97)	13 (9.09)
	46-60	108 (15.08)	22 (20.37)
	>61	71 (9.91)	19 (26.76)
TBSA	20-40	438 (61.17)	11 (2.51)
	41-60	231 (32.26)	15 (6.49)
	>61	47 (6.65)	43 (91.48)
Inhalation injury	281 (39.24)		45 (16.01)
non-inhalation injury	435 (60.75)		24 (5.51)

In examining TBSA for patients with delayed admissions, of the 1,214 patients, 871 had burns covering 20-40% TBSA, with a mortality rate of 8.92% (78 deaths). For the 314 patients with 40%-50% TBSA, the mortality rate increased to 14.64% (46 deaths), and for the 29 patients with burns covering 60% TBSA or more, the mortality rate was critically high at 96.55% (28 deaths) (Table 2).

Table 2: Mortality Rate among Burn Patients with Delayed Admissions

Delayed admission	***Description***	***n= 1214 (%)***	***Mortality N(%)***
Gender	Male	829 (68.28)	104 (12.54)
	Female	385 (31.71)	48 (12.46)
Age (yr)	15-30	452 (37.23)	37 (8.18)
	31-45	398 (32.78)	37 (9.29)
	46-60	251 (20.67)	41 (16.33)
	>61	122 (10.04)	37 (30.32)
TBSA	20-40	871 (71.74)	78 (8.95)
	41-60	314 (25.86)	46 (14.64)
	>61	29 (2.38)	28 (96.55)
Inhalation injury	370 (30.47)		84 (22.70)
non-inhalation injury	844 (69.52)		68 (8.05)

Discussion

This study presents a comprehensive analysis of the outcomes of 1,935 burn patients, highlighting critical factors influencing mortality rates based on the timing of admission, age demographics, inhalation injuries, and TBSA.

The findings demonstrate that delayed admission significantly correlates with increased mortality, with patients presenting late exhibiting a mortality risk 2.83% greater than those admitted urgently. This underscores the importance of timely medical intervention in burn cases, aligning with existing literature indicating that prompt

treatment can improve survival outcomes for burn patients (18). For example, a study of patients admitted with burns to a Red Cross hospital in Afghanistan reported a mortality rate of 16% (19). In comparison, the mortality rate in the current study is 6.37% lower than that observed at the Red Cross hospital. Additionally, early wound grafting has been shown to reduce hospital stays, infection risk, and mortality rates (20). In our study, early admission decreased the mortality rate by a factor of 2.83% among burn patients. Another study indicated a mortality rate of 24.3% among burn patients (21), while our study reported a mortality rate of 9.63% with early admission (Table 1). Furthermore, a study from Karachi, Pakistan, reported a mortality rate of 36% among burn patients (22).

Multi-system organ failure was identified as the leading cause of death among burn patients (64.9%), with sepsis in 21.3% of cases, followed by neurological deterioration (5.3%), cardiac arrest (4.3%), aspiration (4.3%), and shock (3.2%) (23). Mortality rates were found to increase with the severity of burn degree (24). Notably, one study reported a mortality rate of 17.9% for patients with inhalation injuries compared to 9.6% for those without inhalation injury (25). Our study shows 16.01% mortality rate with inhalation injury and 5.51% without inhalation injury, compared to that result, we had 1.89% decreased mortality rate with inhalation injury.

Age-specific mortality rates reveal a concerning trend, with older age groups experiencing substantially higher mortality rates. For instance, patients aged 60 and older faced mortality rates exceeding 26%, consistent with findings from other studies that indicate elderly burn patients had a higher mortality risk due to factors such as comorbidities and decreased physiological reserve (26). As age increases, so does mortality risk (27). High mortality rates for inpatient burn injuries in older adults have been reported, ranging from 7.4% to 66% (15).

Regarding TBSA, mortality rates rose dramatically with increased burn severity. Patients with burns covering 60% TBSA or more faced an alarming mortality rate of 91.48%. This finding reflects the established principle that the extent of burn injuries is a significant predictor of mortality, as larger TBSA burns often lead to systemic complications, including shock and multiple organ failure (28). Both TBSA percentage and the proportion of full-thickness burns significantly impact mortality rates (29). The analysis of delayed admissions revealed a consistent pattern of increased mortality across all age groups, particularly among older adults. Among the 1,219 patients with delayed presentations, those with inhalation injuries demonstrated a concerning mortality rate of 22.7%. This further emphasizes the critical need for timely assessment and treatment of burn injuries, particularly for vulnerable populations.

Conclusion

The findings of this study stress the importance of early intervention, particularly in the elderly and those with significant inhalation injuries or extensive TBSA burns. These results advocate for enhanced pre-hospital care and public awareness campaigns to encourage prompt medical attention for burn injuries, which could ultimately reduce mortality rates. Future research should focus on developing targeted strategies for managing high-risk populations and improving outcomes through timely intervention and comprehensive care protocols.

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Conflict of interest

The authors declare that there is no conflict of interests.

References

1. Schnegelsberg A, Mackenhauer J, Pedersen M, Nibro H, Kirkegaard H. Delayed admission to the icu is associated with increased in-hospital mortality in patients with community-acquired severe sepsis or shock. Critical Care. 2014;18:1-182.
2. Duke JM, Boyd JH, Randall SM, Wood FM. Long term mortality in a population-based cohort of adolescents, and young and middle-aged adults with burn injury in western australia: A 33-year study. Accident Analysis & Prevention. 2015;85:118-124.
3. Tan Chor Lip H, Tan JH, Thomas M, Imran F-H, Azmah Tuan Mat TN. Survival analysis and mortality predictors of hospitalized severe burn victims in a malaysian burns intensive care unit. Burns & Trauma. 2019;7
4. Lionelli G, Pickus E, Beckum O, Decoursey R, Korentager R. A three decade analysis of factors affecting burn mortality in the elderly. Burns. 2005;31:958-963.
5. Sarbazi E, Yousefi M, Khami B, Ettekal-Nafs R, Babazadeh T, Gaffari-Fam S. Epidemiology and the survival rate of burn-related injuries in iran: A registry-based study. Ann Burns Fire Disasters . 2019;32:3-9.
6. Tian H, Wang L, Xie W, Shen C, Guo G, Liu J, et al. Epidemiologic and clinical characteristics of severe burn patients: Results of a retrospective multicenter study in china, 2011–2015. Burns & Trauma. 2018;6:14.
7. Elsous A, Ouda M, Mohsen S, Al-Shaikh M, Mokayad S, Abo-Shaban N, Hamad AA-R. Epidemiology and outcomes of hospitalized burn patients in gaza strip: A descriptive study. Ethiopian Journal of Health Sciences. 2016;26:9-16.
8. Honnegowda TM, Kumar P, Udupa P, Rao P. Epidemiological study of burn patients hospitalised at a burns centre, manipal. Int Wound J. 2019;16:79-83.
9. Dries DJ, Endorf FW. Inhalation injury: Epidemiology, pathology, treatment strategies. Scand J Trauma Resusc Emerg Med. 2013;21:31.
10. Atkins K, Schneider A, Rodriguez C, Gallaher J, Charles A. The predictive probability of mortality in the presence of full-thickness burns. Am J Surg. 2023;225:793-799.
11. Choi YH, Cho YS, Lee JH, Choi Y, Noh SY, Park S, et al. Cadaver skin allograft may improve mortality rate for burns involving over 30% of total body surface area: A propensity score analysis of data from four burn centers. Cell and Tissue Banking. 2018;19:645-651.
12. Capek KD, Sousse LE, Hundeshagen G, Voigt CD, Suman OE, Finnerty CC, et al. Contemporary burn survival. J Am Coll Surg. 2018;226:453-463.
13. Tredget EE, Shankowsky HA, Taerum TV, Moysa GL, Alton J. The role of inhalation injury in burn trauma. A canadian experience. Ann Surg. 1990;212:720.
14. Macedo JLSd, Santos JB. Predictive factors of mortality in burn patients. Revista do Instituto de Medicina Tropical de São Paulo. 2007;49:365-370.
15. Gürbüz K, Demir M. Epidemiological and clinical characteristics and outcomes of inpatient burn injuries in older adults: Factors associated with mortality. Turkish Journal of Trauma & Emergency Surgery. 2022;28:162.
16. Charles WN, Collins D, Mandalia S, Matwala K, Dutt A, Tatlock J, Singh S. Impact of inhalation injury on outcomes in critically ill burns patients: 12-year experience at a regional burns centre. Burns. 2022;48:1386-1395.
17. Puyana S, Ruiz S, Amador F, Mckenney M, Young E, Lim R, Mir H. The outcomes of inhalation injuries in lesser burns: Still a deadly injury. Eplasty. 2021;21
18. Alshammari SM, Almarzouq S, Alghamdi AA, Shash H. Mortality and survival analysis of burn patients admitted in a critical care burn

unit, saudi arabia. Saudi Journal of Medicine & Medical Sciences. 2022;10:216-220.
19. Calder F. Four years of burn injuries in a red cross hospital in afghanistan. Burns. 2002;28:563-568.
20. Rasool AMA, Karmoosh AS. Multiple drug resistance in burn patients. Journal of Advances in Medical and Pharmaceutical Sciences. 2024;26:21-34.
21. Park J, Kym D, Kim M, Cho YS, Hur J, Chun W, Yoon D, Yoon J. Pioneering predictions of aki and akin severity in burn patients: A comprehensive cbc approach. Scientific Reports. 2024;14:675.
22. Ibran Ea, Mirza FH, Memon AA, Farooq MZ, Hassan M. Mortality associated with burn injury-a cross sectional study from karachi, pakistan. BMC Research Notes. 2013;6:1-3.
23. Tasleem S, Siddiqui AI, Zuberi MAW, Tariq H, Abdullah M, Hameed A, Aijaz A, Shah HH, Hussain MS, Oduoye MO. Mortality patterns and risk factors in burn patients: A cross-sectional study from pakistan. Burns Open. 2024;8:13-18.
24. Saber KIM, Abdulah DM, Murad NS, Mustafa ZR. Epidemiologic and clinical characteristics and outcomes of burn patients in kurdistan region: A one-decade large retrospective cross-sectional study. Healthcare in Low-resource Settings. 2024;12
25. Shirani KZ, Pruitt Jr BA, Mason Jr AD. The influence of inhalation injury and pneumonia on burn mortality. Ann Surg. 1987;205:82.
26. Yao WT, Tung KY, Liu YJ. 711 analysis of the risk factors for mortality in elderly burn patients. J Burn Care Res. 2023;44:S133-S133.
27. Chaudhry I. Burns: Frequency and mortality related to various age groups. J Surg Pak. 2009;14:67-71.
28. Prinsloo TK, Kleintjes WG, Najaar K. 601 potential clinical signatures for early inhalation injury prognosis in burns patients. J Burn Care Res. 2024;45:184-184.
29. Age T, Death P. Cause of mortality in thermally injured patients. Die Infektion Beim Brandverletzten.20:7.