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Original Research Article

Study of burn injuries and pattern with seasonal variation in a tertiary care centre

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ABSTRACT

Background: Burn injuries pose a significant public health concern, necessitating a detailed investigation to enhance injury prevention strategies. This study investigates the distribution and patterns of burn injuries in a tertiary care centre, focusing on gender, age, burn types, outcomes, and seasonal variations.
Methods: Data from a multi-year retrospective analysis (2018-2022) were collected and analysed to determine the gender distribution of burn incidents. Additionally, age distributions were examined to understand the prevalence of burns across different age groups. Burn types were classified into flame, scald, electric, and chemical/miscellaneous, while outcomes were categorised as discharged, abscond/LAMA (left against medical advice), death, or transfer to other departments. The study also investigated the seasonal variations in scald and flame burn incidents.
Results: The highest gender disparities were observed in 2018 and 2019, with 748 and 661 male cases, respectively, compared to 355 and 345 female cases. Children aged 1-10 constituted the largest burn cases, followed by individuals aged 25-40. Flame burns were the most common, accounting for the highest number of cases throughout the study period. Scald burns ranked second, followed by electric and chemical/miscellaneous burns. Most burn incidents resulted in discharge, followed by abscond/LAMA cases. Deaths and transfers to other departments were less frequent outcomes. The number of discharged cases increased gradually over the study period, indicating positive treatment outcomes.
Conclusions: The conclusions emphasize the necessity for all-encompassing preventative initiatives, including public awareness campaigns, safety education, and interventions for vulnerable groups.

Keywords: Burn injuries, Retrospective, Scald burns, Seasonal variations, Flame burns, Electric burns

INTRODUCTION

Burn injuries may have lasting effects on both the victim and society. As a result of advancements in burn treatment and care, more people are now forced to deal with the aftereffects of burns due to improved survival rates. Many burn sufferers struggle with both physical and mental health issues. Regular activities like work, play, and sports may also become more difficult. The world health organization has emphasised the need for patients to resume their social, every day, and employment lives as part of their recovery.[1] Around the world, burns are a hazard to public health. According to estimates, 265,000 people worldwide die from burns each year. However, most of these deaths occur in low- and middle-income countries (LMIC) nations, with South-East Asia accounting for over half of all cases. In rural Nepal, burns are the second most frequent injury and cause 5% of disability.[2] Advancements in burn care have significantly improved the survival rates of severely

injured burn victims. This has resulted in a higher proportion of burn survivors in Western society. However, individuals with extensive burns are still susceptible to various complications, including scar formation, contractures, pain, psychological stress, and weakness. These challenges make it difficult for them to reintegrate into work and society.[3]

To address this issue, multidisciplinary and early rehabilitation programs have been developed specifically for burn patients. These programs aim to enhance the overall outcome and facilitate the patient's return to a functional and productive life. Previous studies primarily focused on clinical measurements such as LOS, functional independence, and discharge destinations to evaluate the effectiveness of these programs.[4] In recent years, there has been a growing interest in assessing the return to work (RTW) as a crucial outcome measure following burn care. RTW has gained recognition as an important indicator of successful rehabilitation and reintegration into society after a burn injury.[5] Researchers are now examining the impact of burn care programs on patients' ability to resume work and their overall work-related outcomes. In summary, the significant progress in burn care has improved survival rates for severe burn victims. However, the challenges associated with extensive burns require comprehensive rehabilitation programs. While previous studies have primarily focused on clinical measurements, there is now a greater emphasis on evaluating the RTW as a key outcome measure in burn care.[3] Patients' health, life satisfaction, well-being, and quality of life can all be enhanced by engaging in regular activities. Additionally, patients can gain personally, socially, and economically by returning to work and finding employment. For burn victims, participation in everyday activities and social life is crucial. Studies already conducted revealed that burn victims struggle greatly in these areas.[1]

The international classification of functioning (ICF) is a fundamental set to pinpoint important elements and procedures for a job evaluation. Age, comorbidity, psychological and psychiatric factors, pre-burn employment status, other job-related factors, insurance status, total body surface area (TBSA), burn location, pain, and treatment characteristics are all important factors in RTW after burns.[6] Even though burn injuries happen most often at home, a multicenter study of people with serious burn injuries revealed that 42% of those working outside the house at the time of the incident had received damage at work.[7] With the establishment of burn centres and better medical treatment, the acute care and rehabilitation of people with severe burn injuries have significantly improved. Large burn victims are now more likely to survive and require thorough rehabilitation care emphasizing finding new work.[6]

This study investigates the distribution and patterns of burn injuries in a tertiary care centre, focusing on gender, age, burn types, outcomes, and seasonal variations. The analysis provides valuable insights into the epidemiology of burn incidents, allowing for a better understanding of the etiology and contributing factors. The findings highlight the need for targeted prevention strategies and interventions to reduce the burden of burn injuries.

METHODS

A retrospective study was conducted in Sawai Man Singh medical college, Jaipur, for four years from June 2018 to June 2022. The study enrolled 2348 participants with data from a multi-year retrospective analysis (2018-2022) that were collected and analysed to determine the gender distribution of burn incidents. The study has been approved by institutional ethics committee.

Inclusion criteria

All patients who were hospitalized gave their agreement to take part in the trial, both male and female patients, patients aged >1 year and <60 years, for patients without a history of dementia or mental retardation, 5% of their body surface area is burnt or a length of stay (LOS) longer than one day were included.

Exclusion criteria

Patients who were temporarily hospitalized but received primary treatment elsewhere were excluded.

Burn types were classified into flame, scald, electric, and chemical/miscellaneous, while outcomes were categorized as discharged, abscond/LAMA (left against medical advice), death, or transfer to other departments. The study also investigated the seasonal variations in scald and flame burn incidents. The study was conducted after the approval from the institutional ethics committee.

Statistical analysis

A non-response analysis was conducted to determine whether respondents' traits varied from those of non-responders. Chi-square tests were performed for categorical data, while Mann-Whitney U-tests were used for continuous variables. Descriptive statistics were applied to evaluate participant characteristics, activity impairment, and work results. Depending on burn severity, the entire sample and subgroups underwent analyses. The two subgroups of burn severity were compared in terms of characteristics and results. The traits of individuals with and without work were contrasted as well.

RESULTS

The study examined the gender distribution among burn incident cases over five years from 2018 to 2022. Most burn victims were male, with 3,006 cases compared to 1,337 cases among females. Among the male victims, 1015 were involved in RTW programs, while 597 did not

participate in such programs. Similarly, among the female victims, 220 were engaged in RTW programs, while 516 did not partake in any return-to-work initiatives. Male children accounted for 1,110 cases, while female children accounted for 569 cases (Table 1).

Table 1: Gender distribution.

Year	Male	Female	Male child	Female child
2018	748	355	283	136
2019	661	345	281	185
2020	401	175	151	98
2021	658	236	217	131
2022	498	221	205	119

Table 2 displays the age distribution of burn incidents across various age groups. The highest number of cases occurred among individuals aged 1-10 years, followed by the 25-40 age group. The age group above 60 years had the fewest cases. The highest number of burn incidents among children occurred in 2018, with 306 cases, while the highest number among adults occurred in 2019, with 280 cases.

Table 2: Age distribution.

Year	<1	1-10	10-18	18-25	25-40	40-50	50-60	>60
2018	20	306	93	109	276	262	254	202
2019	14	280	172	116	243	259	248	140
2020	4	172	73	95	140	128	139	74
2021	11	216	121	135	223	247	208	81
2022	17	182	125	121	198	231	97	72

Furthermore, the burn incidents were categorized based on burn type. Flame burns were the most prevalent, accounting for 3,084 cases in total. Electric burns accounted for 1,778 cases, scald burns accounted for 1,136 cases, and chemical/miscellaneous burns accounted for 106 cases (Table 3).

Table 3: Causes of burn.

Year	Flame	Electric	Scald	Chemical/misc.
2018	836	390	273	23
2019	696	437	334	5
2020	418	244	155	8
2021	622	388	172	60
2022	512	319	202	10
total	3084	1778	1136	106

Most cases resulted in discharge from the hospital, ranging from 396 to 645 cases per year. The next most common outcome was absconding/leaving against medical advice (LAMA), with cases ranging from 179 to 463 per year. Deaths were also observed, ranging from 211 to 422 cases per year. Some cases were transferred to other departments, ranging from 25 to 67 cases per year (Table 4).

Table 4: Burn incidents outcomes by year.

Year	Discharged	Abscond/ LAMA	Death	Transferred to another dept.
2018	580	463	422	57
2019	637	392	384	59
2020	396	179	211	39
2021	645	270	260	67
2022	480	252	286	25

The data show the number of scalds burn cases during the summer (April to July) and winter (November to February). Hot water was the leading cause of scald burns, with 80 cases in summer and 48 cases in winter. Hot milk/tea and vegetables also contributed to scald burns but with lower frequencies. Scald burns, on the other hand, were primarily caused by hot water, hot milk/tea, and hot vegetables, with variations in incidence between summer and winter seasons. Hot milk/tea and hot vegetables also contributed to scald burns but with lower frequencies (Table 5).

Table 5: Scald burn incidents by season.

Scald burn type	Summer (Apr 21-July 21)	Winter (Nov 20-Feb 21)
Hot water	80	48
Hot milk/tea	90	22
Hot vegetable	11	5
Total	181	75

Cooking/cylinder blasts were the most common cause of flame burns in both seasons, with 140 cases in summer and 74 cases in winter. Other causes included bonfires/sitting around a fireplace, smoking under sheets/blankets/Anghiti, electricity accidents leading to fire, suicidal incidents, homicidal incidents, and the other accidents such as lamps, firecrackers, and road traffic accidents. Among the flame burns, cooking/cylinder blasts were the most common cause during summers (225 cases) and winter (189 cases) (Table 6).

Table 6: Flame burn incidents by season.

Flame burn	Summer (Apr 21-July 21)	Winter (Nov 20-Feb 21)
Cooking/ cylinder blast	140	74
Bonfire/ sitting around fireplace	5	20
Smoking under sheets/ blankets/Angithi	0	10
Electricity accident leading to the fire	10	26
Suicidal	35	29
Homicidal	10	5
Other accidents (lamps, firecrackers, RTA)	25	25
Total	225	189

Table 7 provides insights into the etiology of scald burn injuries in children by season. Hot water was the primary cause of scald burns, with 2 cases in summer and 23 cases in winter. Hot milk/tea and hot vegetables were also contributing factors but in smaller numbers.

Table 7: Children's scald burn etiology by season.

Children's scald burns injury etiology	Summer (Apr 21-July 21)	Winter (Nov 20-Feb 21)
Hot water	2	23
Hot milk/tea	10	15
Hot vegetable	3	2

Various aspects related to burn incidents. It includes the number of individuals who returned to work (RTW) and those who did not, separated by gender. The employment categories are self (manual), self (technical), service, and unemployed. Also includes information on the percentage of TBSA affected by burns and the percentage distribution of burn causes: flame, scald, electrical, and chemical burns. Regarding burn severity, the percentage of TBSA affected was analyzed. Most burn victims (ranging from 615 to 1127 cases per TBSA category) had less than 20% of their body surface area burned, followed by the 20-40% TBSA category. A smaller percentage of cases had burns affecting 40-60% or more than 60% of their TBSA. Finally, the causes of burn injuries were investigated. Flame burns were the most common cause, accounting for the highest percentage across all gender and employment categories. Scald burns were the second most common cause, followed by electrical and chemical burns. Among the employed individuals, those engaged in self-manual labor accounted for the highest number of burn incidents, while the unemployed had the fewest cases.

DISCUSSION

The study findings highlight the need for targeted prevention strategies, particularly for vulnerable populations such as males, children, and older people. Educational programs on burn prevention and safety measures should be implemented, emphasizing scald and flame burn incidents during the summer. Additionally, the study underscores the importance of prompt medical intervention and treatment to reduce morbidity and mortality associated with burn injuries.

In the present study, the gender distribution analysis revealed more burn incidents among males than females. This finding is consistent with previous research, which has consistently shown a higher prevalence of burn injuries among males. Possible reasons for this gender disparity include occupational exposure differences, high-risk activity engagement, and behavioral patterns. The identification of this gender disparity highlights the need for targeted prevention efforts and educational campaigns specifically tailored to males, with a focus on addressing the factors contributing to their increased risk. Another study's largest patient population is from the working age range of 16 to 59 years.[2] In this study, there were 284 patients, of which 55.6% were female, and 44.4% were male. The increased frequency of flame burns in our study is mostly to blame for the higher incidence among females.

In research by Sahu et al 10,175 burn patients visited the burn casualty throughout the study period, and 42.3% suffered scald. Preschoolers (36.4%) were the most common scald victims, accounting for 56.85% of patients under 15. Children also have a considerably higher TBSA involvement percentage. Scald has clear seasonal fluctuation, peaking in the winter. 36.2 % of patients entered the hospital without receiving any first assistance. Within 24 hours of a burn injury, 74.2% of patients went to the emergency room. The typical wait time between becoming hurt and going to casualty was three hours and thirty minutes.[8] However, in the present study examining the distribution of burn incidents, the study found that the highest number of cases occurred among children aged 1-10 years, followed by the 25-40 age group.

Winter was shown to be the season with the greatest burns. Every month, the month of December saw the most burn incidents. Since Nepal's winters are dry and many people cook and heat their homes with open fires, a fire might easily start in this situation.[2] According to various research, spring and summer were the most prevalent seasons for burn injuries.[9] This study shows similar results where most burn injuries are recorded during summer. The categorization of burn incidents by burn type revealed that flame burns were the most prevalent, followed by electric, scald, and chemical/miscellaneous burns. Flame burns were the leading cause, accounting for the majority of cases. Electric burns, scald burns, and chemical/miscellaneous burns also represented significant proportions, indicating the need for comprehensive prevention strategies targeting these specific burn types. Golshan et al comprehensively assesses the epidemiology of unintentional burns in South Asia. They noted that scalds and flames were the two most frequent types of damage, consistent with our study results.[10] Seasonal patterns were evident in scald burns and flame burns. Scald burns showed variations between summer and winter, with hot water being the primary cause in both seasons. This suggests the importance of implementing preventive measures, such as adjusting water temperature, especially during these seasons. Flame burns, predominantly caused by cooking/cylinder blasts, exhibited similar patterns in both summer and winter. This finding highlights the need for year-round fire safety measures in domestic settings and emphasizes the importance of the safe cooking practices.

Ganesamoni et al study included 222 consecutive patients hospitalized for in-hospital burn damage treatment. Adult burns were caused by 52.5% unintentional harm and

43.9% self-immolation, while non-intentional injury accounted for 95.6% of cases among children under 13. The average TBSA was 48.75%, with extensive burns accounting for 30.18% of patients, and the mortality rate was 60.8%.[11] According to statistics, flame burns outnumbered scald burns during the winter season, implying that using open flames for heating during the colder months may be to blame for the higher burn incidence. Despite seasonal fluctuations in burn incidence and cause, we found no seasonal differences in burn severity as defined by TBSA or overall survival.[12] Previous research from the institution has shown that age and TBSA are the two primary causes of burn mortality in the environment.[13] The vast majority of burns happened at home and were easily avoidable, 61% of patients were youngsters under the age of 15. There were more female cases, and the burns were more severe in women. No patients of any age group survived with burns that covered more than 40% of their body surface area.[14]

The average hospital stay among the 216 survivors was 26 days for electric burn patients, followed by 21 days for flame burn patients. The lengthier hospital stay among flame burn patients can be attributed to the higher average TBSA burn. In the case of the electric burn patient, most injuries were high-voltage burns, which resulted in deeper harm. The overall mortality rate of hospitalized burn patients was 25.4% (72 cases). Mortality among female patients was much higher than among male patients (55 vs 17).[2]

The mean TBSA in a study was high at 29.2%. Time from burn injury to RTW is less frequently described.[3] In a prospective component (mean TBSA of 18±16), Brych et al found a mean time off work of 119 days (±110).[15] The analysis of TBSA affected by burns revealed that most burn victims had less than 20% of their body surface area burned, highlighting the significance of timely and appropriate medical interventions for the optimal recovery.

Limitations

limitations include a narrow focus on demographic factors, retrospective data with potential inaccuracies, limited outcome categories, lack of causality establishment, and a restricted scope in examining seasonal trends. While valuable for identifying trends, the study does not delve into causative factors, broader consequences of burn injuries, or comparative analyses, and it necessitates caution in generalizing findings to other settings.

CONCLUSION

This comprehensive analysis of burn incidents provides valuable insights into the gender distribution, age groups, burn types, outcomes, and seasonal patterns associated with burn injuries. The findings underscore the need for tailored preventive strategies for vulnerable populations, such as children and young adults. Effective burn prevention measures should address the specific burn types and cause prevalent in the community. The study findings can guide public health interventions, enhance burn care protocols, and reduce burn-related morbidity and mortality. Further research is warranted to explore additional factors influencing burn incidents and to evaluate the effectiveness of prevention and intervention strategies.

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