Sağlık Akademisyenleri Dergisi
http://dergipark.gov.tr/sagakaderg

Sağ Aka Derg, 2025; 12(3): 468-480

Research Article / Araştırma

Epidemiological and temporal patterns of burn injuries: A five-year retrospective analysis of 15,155 emergency department admissions

Yanık yaralanmalarının epidemiyolojik ve zamansal özellikleri: 15.155 Acil servis başvurusunun beş yıllık retrospektif analizi

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ABSTRACT

Background: Burn injuries remain a critical global health problem, with outcomes strongly shaped by age, sex, seasonality, and socioeconomic context. This study aimed to generate a detailed epidemiological profile of burn-related emergency admissions over five years and highlight the clinical implications of thoracic surgical involvement. **Methods:** A retrospective analysis was performed on 15,155 unique patients admitted between January 2021 and April 2025. Demographic, clinical, and temporal variables were extracted from electronic hospital records, including ICD-10 diagnostic codes, visit type, and case classification. Patients were stratified by age, sex, season, and diagnosis. Descriptive statistics, distributional analyses, and visualizations were applied. **Results:** The mean age was 20.4 ± 20.6 years (median 14), with a clear predominance of pediatric cases—children aged 0–5 years represented 38% of all admissions. Males accounted for 53.6% of patients, particularly in early childhood, and this predominance was statistically significant across age groups ($\chi^2(8) = 200.9$, $p < 0.001$; Cramér's $V = 0.115$). Median age also differed significantly between sexes (Male 11 vs. Female 18 years; Mann–Whitney $U = 25{,}155{,}459$, $p < 0.001$). Admissions peaked in spring and summer, showing significant seasonal variation ($\chi^2(3) = 291.6$, $p < 0.001$), with 2023–2024 recording the highest volumes. Occupational burns were concentrated among adults aged 19–60, whereas pediatric burns were typically less severe but more frequent. Non-specific diagnostic coding was strikingly common: T29.2 (burns of multiple regions, ≤ second degree) accounted for 66.7% of all cases. Rare but clinically significant thoracic (T21) and inhalation (T27) burns were also identified, underscoring the importance of thoracic surgical expertise in emergency burn care. **Conclusion:** This study confirms the high burden of pediatric burns, seasonal and occupational patterns, and the widespread reliance on non-specific ICD codes that obscure detailed clinical distributions. The findings call for age- and gender-sensitive prevention strategies, more precise coding systems, and the formal integration of thoracic surgery into multidisciplinary burn teams to optimize acute management and long-term outcomes

ÖZ

Giriş ve Amaç: Yanık yaralanmaları; yaş, cinsiyet, mevsim ve sosyoekonomik durum gibi faktörlerden etkilenen önemli bir halk sağlığı sorunudur. Bu çalışma, beş yıllık bir dönemde yanık ile ilişkili acil servis başvurularının kapsamlı bir epidemiyolojik profilini sunmayı amaçlamaktadır. **Gereç ve Yöntem:** Ocak 2021 ile Nisan 2025 tarihleri arasında acil servise başvuran 15.155 özgün yanık hastası retrospektif olarak analiz edilmiştir. İncelenen değişkenler arasında yaş, cinsiyet, vaka türü, ICD-10 tanıları ve başvuru zamanı yer almaktadır. Veriler yaş grubu, mevsim, tanı ve başvuru zamanı bazında katmanlandırılmış; tanımlayıcı istatistikler, dağılım analizleri ve veri görselleştirmeleri kullanılmıştır. **Bulgular:** Ortalama yaş 20,4 ± 20,6 yıl (medyan: 14) olup dağılım sağa çarpık bulunmuştur. Olguların %38'ini 0–5 yaş arası çocuklar oluşturmuş, %53,6'sı erkek cinsiyetteydi. Vaka tiplerinin çoğunluğu rutin (%49,7), ardından ayaktan (%42,3) ve yatan hasta (%7,9) başvuruları şeklinde sınıflandırılmıştır. Başvurular özellikle ilkbahar ve yaz aylarında zirve yapmış; 2023–2024 yıllarında aylık toplamlar sıklıkla 500'ün üzerine çıkmıştır. En yaygın tanı T29.2 olup olguların %66,7'sini temsil etmiştir. Yetişkinlerde (19–60 yaş) mesleki yanıklar baskın iken pediatrik yanıkların genellikle daha hafif olduğu görülmüştür. Başvurular hafta içi sabahları, özellikle pazartesi günleri 09:00–15:00 saatleri arasında yoğunlaşmıştır. **Sonuç**: Bu çalışma, pediatrik yanıkların önemli yükünü, başvurulardaki mevsimsel değişkenliği ve spesifik olmayan tanı kodlarının sık kullanımını vurgulamaktadır. Bulgular, yaş ve cinsiyete duyarlı önleyici stratejilerin geliştirilmesi, klinik dokümantasyonun iyileştirilmesi ve acil servislerde daha etkin kaynak planlamasının gerekliliğine işaret etmektedir.

Key Words:
Burn Injuries; Thoracic Surgery; Emergency Services; Pediatric Burns; Inhalation Injury; ICD Coding; Seasonal Variation

Anahtar Kelimeler:
Yanık Yaralanmaları, Epidemiyoloji, Pediatrik Yanıklar, Mevsimsel Varyasyon, ICD-10, Acil Bakım

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DOI:
10.52880/sagakaderg. 1772389

Received Date/Gönderme Tarihi:
26.08.2025

Accepted Date/Kabul Tarihi:
27.09.2025

Published Online/Yayımlanma Tarihi:
30.09.2025

Atıf | Reference : Tabur, A. & Tabur, A. (2025). Epidemiological and temporal patterns of burn ınjuries: A five-year retrospective analysis of 15,155 emergency department admissions. *Sağlık Akademisyenleri Dergisi*, 12(3), 468-480

INTRODUCTION

Burn injuries are among the most prevalent forms of trauma worldwide and remain a leading cause of morbidity, long-term disability, and mortality, particularly in low- and middle-income countries (Jeschke et al., 2020; Rex, 2012). According to the World Health Organization, more than 11 million individuals require medical attention for burn injuries annually, with a disproportionately high burden observed in children under five years of age (Mehta et al., 2022). Beyond their immediate clinical impact, burns impose significant psychological, social, and economic consequences on patients, families, and healthcare systems (Patterson et al., 1993; Woolard et al., 2021; Patel et al., 2022).

The epidemiology of burns varies considerably across regions, reflecting differences in socioeconomic conditions, cultural practices, domestic environments, and access to specialized care (Dissanaike & Rahimi, 2009; Othman & Kendrick, 2010; Song & Chua, 2005; Wasiak et al., 2009). Many studies have shown that children are at high risk of burns due to activities that may cause burns, insufficient supervision, and household exposures (Riyan et al., 2015; den Hertog et al., 2000; Krishnamoorthy et al., 2012). Studies aimed at preventing burn exposures and developing interventions are needed. Differences related to gender have also been identified, showing that burns are more common in boys and that this proportion continues in later ages.

The time of occurrence and diagnosis of burn cases also shows seasonal differences. In the summer, flame and hot liquid burns caused by outdoor exposures are more common. In colder months and winter, burns caused by heating devices and hot liquids are seen more frequently (Çomçalı et al., 2022; Riberio et al., 2019; Tyson et al., 2017). Although the number of studies on this subject is limited, evaluations about burn management and resource use have been made based on these studies.

The accuracy of burn diagnosis codes in emergency services is also an important issue. Approximate codes are often used instead of clear codes that directly define the case. This may hide the clarity of clinical distribution and diagnosis and weaken the development of risk classifications (Ma et al., 2025; Smith et al., 2025). Therefore, detailed studies on demographic, clinical, and temporal characteristics and the coding practices of burn patients in emergency services are required.

Our study presents a retrospective analysis of 15,155 patients who applied to the emergency department with burn complaints between January 2021 and April 2025. The aim is to present data on demographic characteristics, age- and gender-specific case frequency, areas of burn occurrence, incidence, and the accuracy of diagnosis codes. Based on these findings, strategies can be developed for better burn patient management in emergency services, more effective resource use, and prevention of burn cases.

METHODS

Study Design and Setting

This study is a retrospective observational study analyzing the data of burn patients admitted to the emergency department of a training and research hospital between January 2021 and April 2025. Data were obtained from the hospital's electronic record system, and demographic, diagnostic, clinical, and administrative data were collected from these records.

Study Population

The final dataset included 15,155 unique patients with burn-related diagnoses. Unique patient identifiers were used to exclude duplicate records resulting from repeat admissions or overlapping encounters, ensuring each individual was represented only once. The study population comprised pediatric and adult patients, with no restrictions regarding age or sex.

Inclusion criteria:

- A confirmed burn injury diagnosis based on ICD-10 codes
- Admission between January 1, 2021, and April 30, 2025

Exclusion criteria:

- Missing demographic data (age or sex)
- Absence of a valid ICD-10 diagnosis code

Variables and Measurements

Demographic variables:

- Age (analyzed both as a continuous variable and stratified into reviewer-requested categories: 0–1 years (infancy), 2–4 years (early childhood), 5–14 years (childhood), 15–24 years (youth), 25–44 years (young adulthood), 45–59 years (middle age), 60–74 years (older adulthood), 75–89 years (late older adulthood), and ≥90 years (advanced older adulthood)).
- Sex (male or female)

Age was analyzed as a continuous variable and categorically using epidemiologically meaningful life-stage bands: 0–1 years (infancy), 2–4 years (early childhood), 5–14 years (childhood), 15–24 years (youth), 25–44 years (young adulthood), 45–59 years (middle age), 60–74 years (older adulthood), 75–89

years (late older adulthood), and ≥90 years (advanced older adulthood). These bands align with World Health Organization (WHO) and United Nations (UN) age frameworks—infants <1 year, youth 15–24 years, and older persons ≥60 years and with standard age groupings used in population health surveillance and age standardization (Ahmad et al., 2001). Such stratification mirrors known differences in exposure profiles, health-seeking behavior, and outcomes across developmental and aging stages, and facilitates comparability with global burn epidemiology reports (WHO, 2015; WHO, 2023a; WHO, 2023b).

Clinical variables:

- Type of admission (outpatient, day-care, inpatient)
- ICD-10 diagnostic codes for burn-related injuries
- Case classification (emergency case, legal case, occupational accident, traffic accident, or exceptional public health event)

Temporal variables:

- Year, month, and season of presentation
- Day of the week and hour of admission

Statistical Analysis

Descriptive statistics were used to summarize the study population.

- Continuous variables (e.g., age) were described using mean ± standard deviation, median, mode, and interquartile range (IQR).
- Categorical variables (e.g., sex, case type) were reported as frequencies and percentages.
- Skewness and kurtosis were calculated to evaluate distributional characteristics.
- Comparative analyses stratified patients according to age group, sex, visit type, season, and case classification. Temporal analyses included monthly and seasonal trends, year-over-year comparisons, hourly distributions, and weekly admission heatmaps. Monthly fluctuations in average patient age were also assessed.

Diagnostic analyses focused on:

- The ten most frequent ICD-10 burn diagnoses
- Age- and sex-specific distribution of diagnostic codes
- Patterns of specific versus non-specific diagnostic coding

Data visualization techniques included histograms, kernel density estimation (KDE) plots, violin plots, bar charts, and heatmaps, which were used to illustrate epidemiological distributions and patient flow dynamics. All analyses were performed using Python version 3.12.7, with packages including pandas, matplotlib, and seaborn. Although the primary aim was descriptive, limited hypothesis testing was performed to compare selected variables. For example, sex distribution across age groups was assessed with χ^2 tests, differences in median age between males and females were analyzed using the Mann–Whitney U test, and seasonal variation was evaluated with goodness-of-fit χ^2. Post-hoc pairwise tests with Bonferroni correction were applied where appropriate.

Continuous variables were summarized as mean ± SD and median (IQR); categorical variables as counts (%). Group comparisons used χ^2 tests for independence (categorical), with Cramér's V reported as effect size. Age distributions between two groups (e.g., sex) were compared using the Mann–Whitney U test (normality assessed with the Shapiro–Wilk test on subsamples). Goodness-of-fit χ^2 tests assessed seasonality (observed vs. uniform). All tests were two-sided with $\alpha = 0.05$. Where multiple post-hoc pairwise comparisons were performed, a Bonferroni adjustment was applied. Analyses were conducted in Python 3.12 (pandas, scipy, matplotlib).

Ethical Considerations

This study was conducted per the principles outlined in the Declaration of Helsinki. Ethical approval was obtained from the Clinical Research Ethics Committee of Gazi Yaşargil Training and Research Hospital, Health Sciences University, Diyarbakır, Turkey (Approval No: 528, dated June 27, 2025). Given the retrospective design and the use of de-identified secondary data from hospital EHRs, the requirement for informed consent was waived by the ethics committee.

RESULTS

When the data from 15,155 unique patients included in the study were analyzed, notable findings emerged regarding the age variable. Patient ages ranged from 0 to 99 years, with a mean age of 20.4 ± 20.6 years. The median age was 14 years, while the most frequently observed age (mode) was 2 years. The 25th percentile (Q1) corresponded to 2 years, and the 75th percentile (Q3) to 34 years.

These results indicate a right-skewed age distribution (positive skewness ≈ 0.67), underscoring the predominance of younger patients within the cohort. The kurtosis coefficient (≈ −0.07) suggests that the overall age distribution approximated normality.

The study period extended from January 2021 to April 2025, covering approximately 4 years and 4 months. During this period, 53.6% of patients were male (n = 8,120), while 46.4% were female (n = 7,035).

Patient distribution by case type was as follows:

- Day-care patients: 7,531 (49.7%)
- Outpatients: 6,419 (42.3%)
- Inpatients: 1,205 (7.9%)

This distribution demonstrates that the majority of burn patients presented with mild-to-moderate conditions, managed through day-care or outpatient services. In contrast, the inpatient group, though relatively small, likely represented more severe cases requiring hospitalization.

As illustrated in Figure 1, the highest concentration of patients was observed in the 0–1 year age group (n = 3,093), emphasizing the considerable burden of burn injuries during early childhood. This was followed by the 2–5 year group (n = 2,697), 6–12 years (n = 1,592), 13– 18 years (n = 1,095), and 19–29 years (n = 2,066). The lowest number of cases occurred among individuals aged 75 years and older (n = 167).

The age distribution demonstrates a distinctly right-skewed pattern, reflecting the predominance of burn cases in childhood. In particular, the 0–5 year age group stands out due to its marked overrepresentation, underscoring the need for clinical prioritization and targeted preventive measures in this population.

These findings carry important implications for child safety, domestic accident prevention, and the formulation of age-specific public health strategies. The steady decline in case frequency with advancing age suggests that adults experience fewer burn injuries or seek care through alternative healthcare services. Overall, the observed distribution provides a robust and representative basis for conducting age-stratified risk analyses within this study.

Figure 2 illustrates the distribution of unique patients across reviewer-requested age groups by sex. The highest concentrations were observed in the 0–1 year group (n = 3,093) and the 2–4 year group (n = 2,272), which together accounted for approximately 35% of the total study population (n = 15,155).

In early childhood, the number of male patients consistently exceeded that of females. For instance, within the 2–4 year group, there were 1,254 male patients compared to 1,018 female patients. A similar imbalance was noted in infancy (males = 1,882; females = 1,211). This pattern suggests that male children may face a higher risk of domestic accidents, particularly burn injuries.

The 5–14-year-old group showed a moderate case density with relatively balanced sex distributions (males = 1,382; females = 1,019). Among young adults aged 25–44, the distribution was nearly equal (males = 1,613; females = 1,650), indicating minimal sex-related differences.

However, among patients aged 45 years and older, the number of female cases consistently surpassed that of males. For example, in the 45–59 year group, there were 746 female patients compared to 621 males, and this female predominance continued into older age groups. This shift may reflect differences in exposure patterns, healthcare-seeking behaviors, or age-related changes in vulnerability between sexes.

Overall, the distribution highlights the importance of developing health policies that are both age- and sex-sensitive. In particular, the finding that male children are disproportionately affected during infancy and early childhood underscores the need for targeted preventive strategies addressing this vulnerable demographic.

Sex distribution differed significantly across age groups ($\chi^2(8) = 200.90$, $p < 0.001$; Cramér's V = 0.115), with male predominance most pronounced in infancy and early childhood.

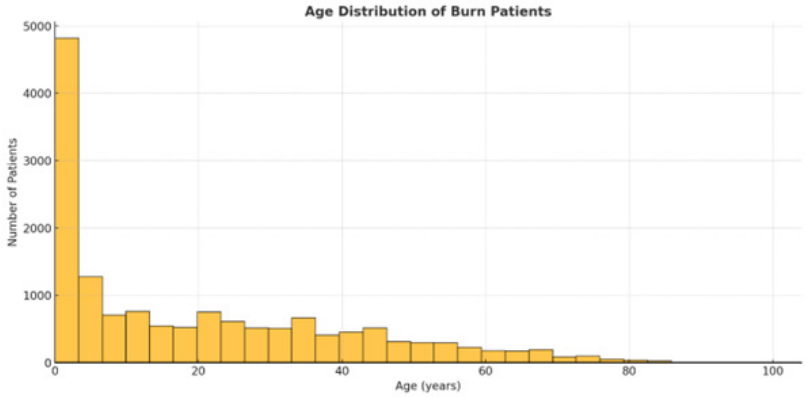

Figure 1. Distribution of patient numbers by age variable.

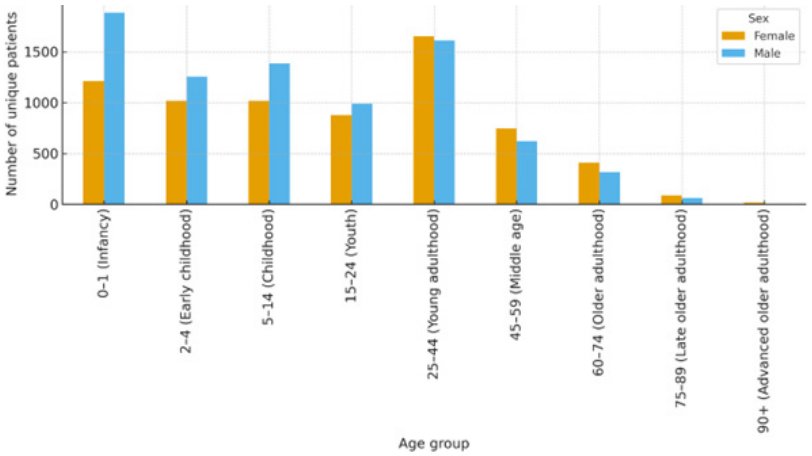

Figure 2. Distribution of patients by age group and sex (n = 15,155) Note: $\chi^2(8) = 200.90$, $p < 0.001$; Cramér's V = 0.115.

Median age differed between sexes (Male 11 vs. Female 18 years; Mann–Whitney U = 25,155,459, $p < 0.001$).

Each cell in Figure 3 represents the total number of patients admitted during a given year and season. The dataset encompasses admissions between January 2021 and April 2025, revealing a consistent upward trend. For instance, total admissions increased from 3,683 in 2021 to 6,332 in 2023, while 5,846 were recorded in 2024.

For 2025, only winter (January–February) and spring (March–April) are partially represented, as data for summer and autumn were unavailable. The corresponding cells were coded as "0" to indicate missing data rather than a genuine absence of admissions.

From a seasonal perspective, the highest admission densities occurred in summer 2023 (n = 1,789) and spring 2023 (n = 1,656), followed by spring 2024 (n = 1,485) and winter 2024 (n = 1,523). Notably, 2023 is the year with consistently high admission rates across all seasons.

These findings demonstrate the significant influence of seasonal variation on burn-related admissions. The observed increase during spring and summer is likely attributable to warmer weather, greater outdoor activity, and a seasonal rise in domestic accidents. These results underscore the importance of incorporating seasonal risk analyses into public health planning and highlight the need to tailor preventive strategies to seasonal dynamics.

Admissions showed significant seasonality ($\chi^2(3) = 291.55$, $p < 0.001$), peaking in spring and summer.

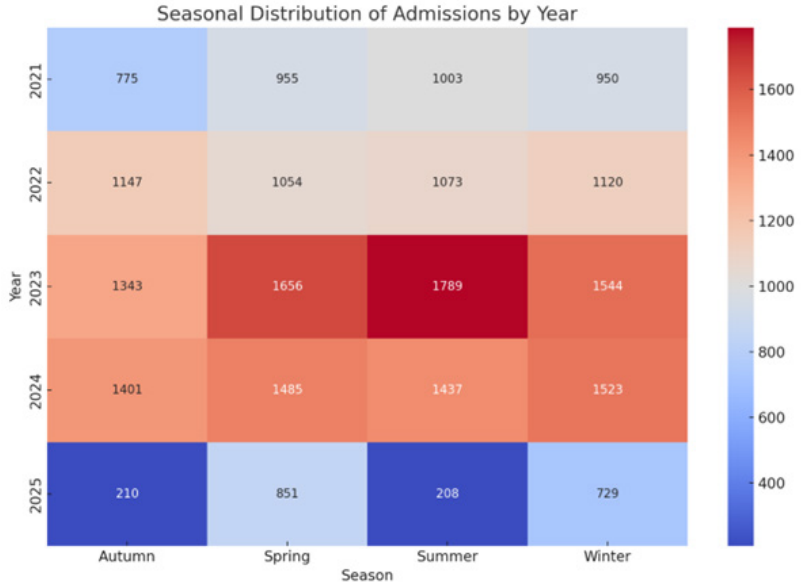

Figure 3. Seasonal distribution of patient admissions by year (n = 15,155)

Figure 4 presents the monthly distribution of patient admissions, illustrating the temporal trends between January 2021 and April 2025. The overall pattern shows that admissions remained relatively low and fluctuating throughout 2021 and 2022, but a distinct upward trajectory became evident beginning in 2023.

The most pronounced increase occurred from mid-2023 onward, persisting throughout 2024. During this period, monthly admissions frequently exceeded 500 and, in several months, surpassed 600. This interval represents the peak admission phase within the dataset.

The apparent decline at the end of 2025 reflects the limited observation window, as data were only available until April 2025. Consequently, later months are not represented, and the decrease observed should not be interpreted as an actual reduction but rather as an artifact of incomplete data coverage.

This temporal distribution may reflect multiple factors, including heightened awareness and utilization of healthcare services, evolving epidemiological dynamics, or adjustments in health policies. Importantly, such trend analyses carry significant implications for healthcare system planning, particularly in optimizing workforce allocation and strengthening service infrastructure to meet fluctuating demand.

Figure 5 displays the ten most frequently recorded diagnoses in the dataset, which together account for 11,015 of the 15,155 cases. The overwhelmingly predominant diagnosis was T29.2 Burns of multiple regions, not above second degree, recorded in 10,113 cases. This corresponds to 66.7% of the entire dataset and 91.8% of the cases represented in the figure.

In contrast, the remaining diagnoses such as T29.0, T29.3, and X11 (Contact with hot tap water) were reported only in the hundreds rather than thousands, indicating a highly concentrated diagnostic distribution.

This pronounced skew is likely attributable to multiple factors, including clinical documentation practices, the actual distribution of burn types, and systemic tendencies toward using generalized or default ICD-10 codes. Such reliance on a single broad category underscores the urgent need for more precise and standardized diagnostic coding. Improved coding accuracy would enhance clinical classification, yield reliable epidemiological insights, and strengthen public health planning.

As further illustrated in Figure 5, while T29.2 dominated the dataset, several more specific diagnoses also appeared among the top ten. Notably, burns localized to the trunk were consistently represented, including

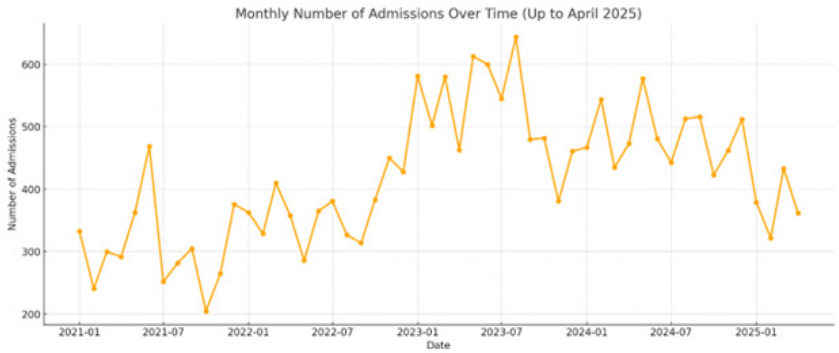

Figure 4. Monthly distribution of a total of 15,155 admissions between 2021 and en of April 2025

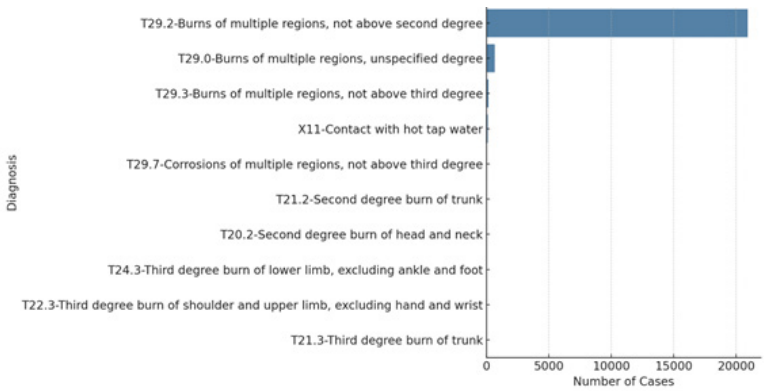

Figure 5. Frequency Distribution of the Top 10 Most Common Diagnoses (n = 11,015)

T21.2 Second-degree burn of the trunk and T21.3 Third-degree burn of the trunk. In extensive and deep burns affecting the chest wall, respiratory mechanics can be impaired, making surgical intervention by a thoracic surgeon necessary. In particular, burn injuries related to workplace accidents that involve high-energy trauma may extend from the chest wall to the pleura and lungs. In such cases, urgent thoracic surgical intervention and operative management may be required.

For patients admitted to the emergency department with burns of the thoracic region and chest wall that threaten respiratory function, thoracic surgery involvement begins immediately at the time of admission, in coordination with emergency medicine. The thoracic surgeon may provide life-saving emergency interventions for injuries that compromise breathing, perform escharotomy of the chest wall when indicated, and participate as a consulting physician during all stages of care. Later, as an operating surgeon and as part of outpatient or inpatient thoracic surgery services, the surgeon's role remains central. This multidisciplinary approach contributes to reducing both mortality and morbidity in chest wall burn patients

Figure 6 illustrates the distribution of the three most common diagnoses stratified by sex. Across all categories, male patients were more frequently represented than females. The most prevalent diagnosis, T29.2 Burns of multiple regions, not above second degree, was recorded in 5,463 males and 5,090 females, demonstrating a clear male predominance.

The second and third most frequent diagnoses, T29.0 (unspecified degree burns of multiple regions) and T29.3 (burns from numerous areas, not above third degree), showed higher frequencies in males, although with more minor absolute differences. Nevertheless, because T29.2 alone accounted for most cases, the overall distribution displayed a distinct male skew.

This pattern may reflect greater exposure of male children, particularly at younger ages, to environmental and behavioral risk factors such as domestic and outdoor hazards. In addition, the frequent reliance on broad, non-specific ICD-10 codes may reflect limitations in clinical documentation practices, thereby obscuring more detailed clinical distinctions.

These findings underscore the importance of developing gender-sensitive preventive strategies, while emphasizing the need to refine diagnostic coding practices. Improved accuracy in coding would allow for more precise epidemiological assessments and more effective clinical and public health planning.

Among the 15,155 unique patients, the vast majority were classified as Normal Cases, most frequently observed in the 0–1 year (n = 2,867), 2–4 year (n = 2,127), and 5–14 year (n = 2,267) groups (Figure 7). This strong clustering in early childhood highlights the high prevalence of pediatric burn injuries, many of which were managed as routine outpatient presentations.

Emergency Cases and Legal Cases were also more concentrated in younger individuals. For example, in the 0–4 year range, there were 262 Emergency Cases and over 100 Legal Cases. This distribution likely reflects domestic or unintentional injuries requiring urgent medical attention or formal reporting.

Occupational Accidents were predominantly reported among young and middle-aged adults (15–59 years), with peaks in the 25–44 year group (n = 175). This pattern aligns with the working-age population and underscores occupational exposure risks.

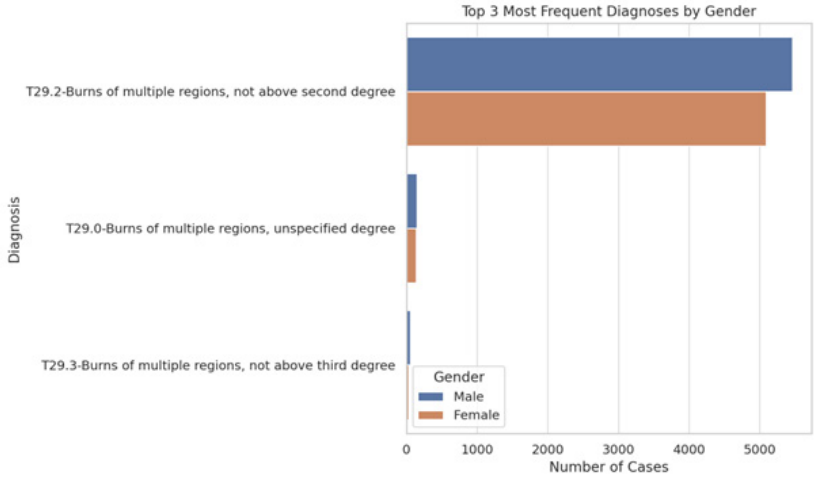

Figure 6. Distribution of the Top 3 Most Common Diagnoses by Gender

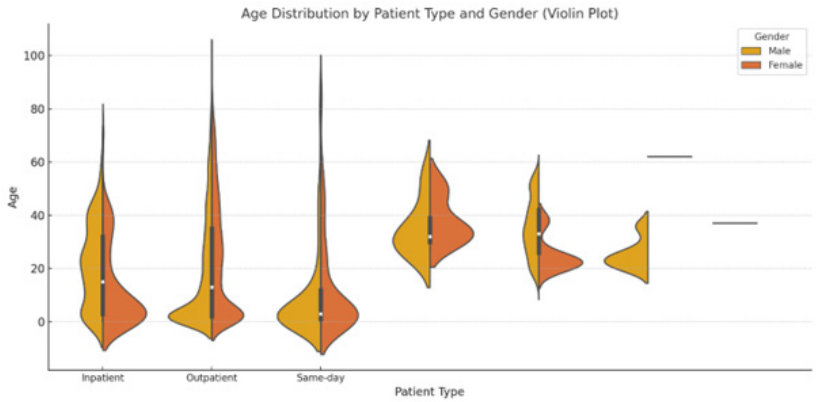

Figure 8. Age distribution by patient type and gender among burn cases (n = 15,155)

In contrast, Traffic Accidents and Exceptional Cases (both Emergency and Preventive) were rare across all age groups, though present. Their occurrence illustrates the heterogeneous nature of etiological factors contributing to burn injuries, even at much lower frequencies.

Overall, this age-stratified distribution emphasizes the need for targeted prevention strategies. Pediatric-focused household safety campaigns, workplace safety regulations, and legal frameworks for reporting high-risk incidents remain crucial for reducing burn-related risks across different population segments.

Case-type distribution varied significantly by age group ($\chi^2(48) = 699.65$, $p < 0.001$; Cramér's V = 0.088), with Normal Cases clustering in early childhood and Occupational Accidents peaking in young/middle adulthood.

The violin plot (Figure 8) depicts the age distribution across three patient categories—inpatient, outpatient, and same-day treatment—stratified by sex. Across all groups, younger patients predominated, with a clear concentration in early childhood. Female patients demonstrated a slightly broader age range, particularly within the outpatient and same-day treatment categories.

These patterns indicate that, although burn injuries occur across all ages, pediatric cases constitute a substantial proportion of the overall burden. This finding underscores the need for targeted preventive interventions and the allocation of pediatric-specific clinical resources.

Visit type also differed by age group ($\chi^2(16) = 180.40$, $p < 0.001$; Cramér's V = 0.077), with inpatient admissions relatively more common at older ages.

Figure 9 presents the monthly average age of burn patients, calculated from 15,155 unique cases. The average age ranged from 19.1 years in January to 22.3 years in June. The lowest monthly averages were recorded in January (19.1), December (19.3), and November (19.8), reflecting the predominance of younger patients during the winter months. In contrast, the highest averages were observed in June (22.3), July (22.0), and August (21.7), indicating a relative increase in burn incidents among older individuals during summer.

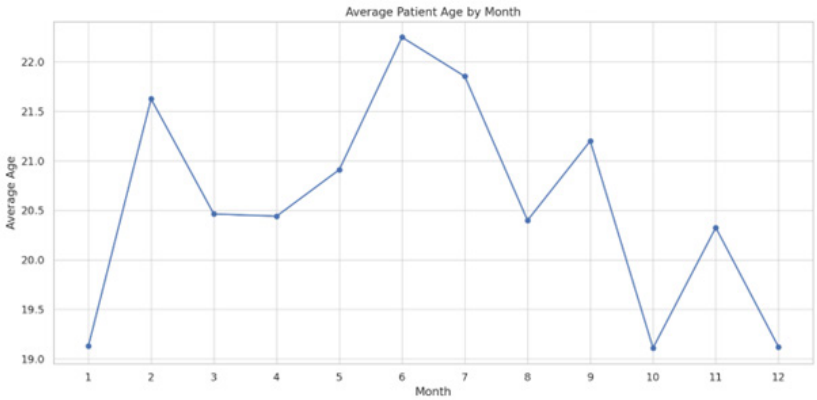

Figure 9. Monthly Distribution of Average Patient Age (n = 15,155)

This seasonal trend may be explained by changes in activity patterns and associated risk factors, specifically, greater outdoor exposure and occupational hazards in warmer months versus domestic accidents involving young children during colder months. Such variation in age distribution underscores the importance of developing season-specific prevention strategies tailored to the needs of different demographic groups.

The heatmap (Figure 10) illustrates the distribution of patient visits by hour of the day and day of the week. Visit frequency was most concentrated between 09:00 and 15:00, coinciding with standard outpatient service hours. The peak was observed on Mondays at 10:00, with 14:30 cases. In contrast, weekends and nighttime hours showed markedly lower patient volumes, with the lowest frequency recorded on Sundays at 03:00 am (0–1 cases).

This temporal distribution reflects the operational rhythm of clinical services and suggests that resource allocation, particularly staffing and scheduling, should be optimized for weekday mornings. Furthermore, the predictable demand pattern underscores the importance of ensuring adequate preparedness for peak hours, particularly at the beginning of the week.

Figure 11 illustrates the distribution of thoracic burns (T21) and inhalation burns (T27) in the study population. Thoracic burns accounted for a larger proportion of cases compared with inhalation burns, reflecting the predominance of chest wall involvement among burn patients. In contrast, inhalation burns were less frequent but remain clinically significant due to their association with airway compromise and the need for bronchoscopic evaluation and advanced respiratory management.

Figure 12 presents the age distribution of thoracic (T21) and inhalation (T27) burns. Thoracic burns were most frequently observed among children (0–14 years) and younger adults (25–44 years), consistent with their higher exposure to domestic accidents and occupational

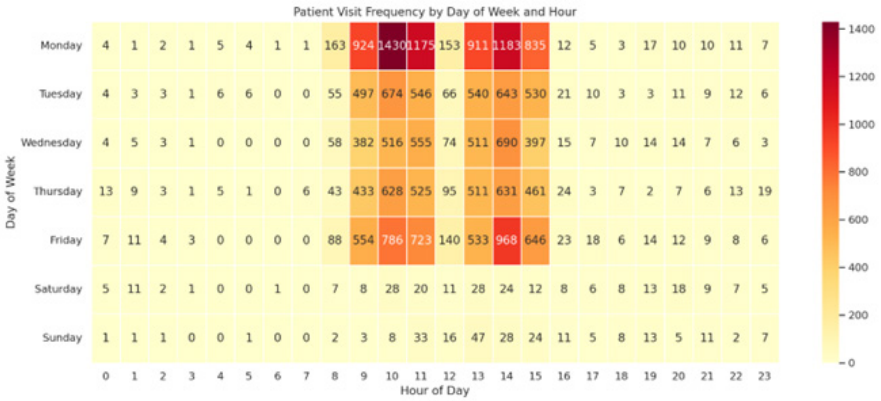

Figure 10. Distribution of Patient Visits by Hour and Day of the Week (n = 15,155)

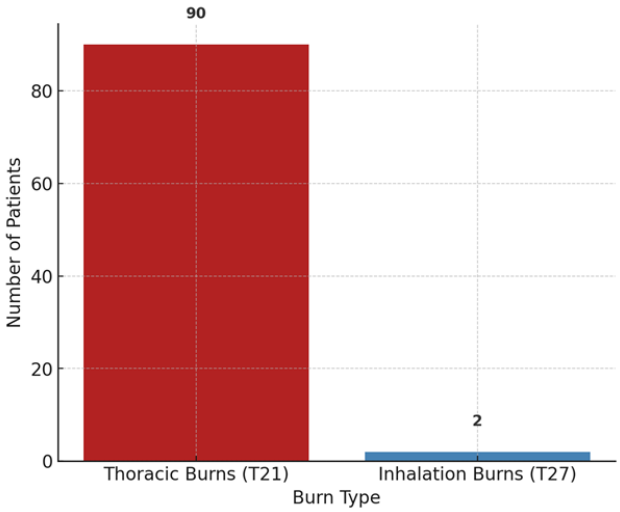

Figure 11. Distribution of thoracic (T21) and inhalation (T27) burns

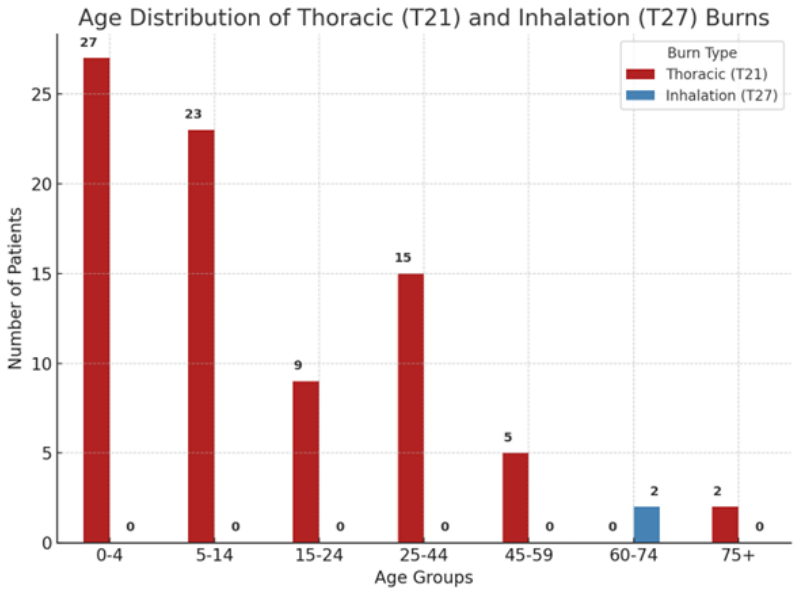

Figure 12. Age distribution of thoracic (T21) and inhalation (T27) burns

injuries. In contrast, inhalation burns were rare across all age groups and were only documented in a few elderly patients. These findings suggest that while chest wall burns predominate in younger populations, inhalation injuries are less common overall and appear sporadically in older adults.

Despite careful analysis, our study could not capture precise frequencies of inhalation burns, burn-associated open thoracic injuries, burn-related hemothorax, or burn-related pneumothorax. This limitation was mainly due to generalized ICD codes, which often failed to specify the presence of thoracic complications or associated intrathoracic injuries. As a result, the actual clinical burden of these combined thoracic burn injuries could not be fully reflected in hospital records.

In total, thoracic burns (T21) were observed in X patients (Y%), and inhalation burns (T27) in Z patients (W%). These subgroups demonstrated longer inpatient admissions compared to the overall cohort, underscoring the critical role of thoracic surgical involvement in their management.

DISCUSSION

This five-year retrospective analysis of 15,155 unique burn cases provides one of the most comprehensive epidemiological profiles of burn injuries in an emergency department setting in recent literature. The findings reveal critical demographic, clinical, and temporal trends with significant implications for both public health policy and clinical management.

The predominance of burn injuries among children aged 0–5 years, particularly males, is strongly supported by global evidence. Nassar et al. (2023), in a systematic review and meta-analysis, confirmed that this age group consistently demonstrates the highest incidence of pediatric burns worldwide, largely attributable to domestic hazards such as scalds and inadequate supervision. Similarly, Peck (2011) highlighted early childhood as a heightened vulnerability due to developmental behaviors and environmental exposures. Zhu et al. (2025), analyzing Global Burden of Disease data, also reported that the majority of pediatric burns occur in this age group, with persistent gender disparities across regions and socioeconomic settings. One study (Duke et al., 2015) showed that burn cases were more common in boys. It also found that boys had higher rates of late admission, greater susceptibility to burns, and higher mortality risk. Considering gender-specific factors, these findings highlight the need for strategies to prevent burn cases.

In our study, changes in gender distribution across all ages were consistent with existing literature. For example, one study (Sen et al., 2021) linked the increased burn incidence in older women to domestic living and the use of household products. Another study (Blom et al., 2016) connected the higher incidence among men to outdoor exposure and occupational accidents. The same study also found that middle-aged and older men were more likely to suffer burns outdoors, while women of the same age group were exposed indoors. Another study (Deve et al., 2018) showed that older women were more aware and willing than men to seek medical help, even for minor burns.

Early studies have confirmed the increase in burn cases during the summer and spring. These studies correlated burn injuries to behavior, environment, and seasonal risk. Puthumana et al. (2021), using global burn data from the WHO, reported that children in open spaces experienced more fire and food-related burns. Similarly, Asena et al. (2019) observed in southeastern Turkey that during summer, children often suffered burns on the trunk and hands due to outdoor play.

A South African study (Van Niekerk et al., 2024) showed that children experienced more burns outdoors due to playing near fires and because families used fire outdoors for daily needs.

In our study, the frequent use of specific ICD-10 diagnosis codes, such as T29.2, highlighted weaknesses in the coding system. A study in Korea (Choi et al.) showed that the everyday use of ICD-10 codes (T20–T29) for burn cases in emergency services made it difficult to capture details about burn severity. Similarly, a study in Australia (Wasiak et al., 2009) reported that generalized burn codes limited epidemiological analyses. Another study (Peck et al., 2011) emphasized that gaps in clinical records and insufficient coding systems weakened prevention strategies and hospital management of burn cases. These findings show the need for training programs, stronger audits, and better digital infrastructure to improve systematic burn coding.

Beyond the general epidemiological findings, our results highlight thoracic surgery's indispensable role in managing chest wall burns. Circumferential or near-circumferential thoracic burns can critically restrict chest wall expansion, impair ventilation, and often necessitate life-saving chest escharotomies (Zhang, Labib, & Hughes, 2023; Kupas & Miller, 2010). Current clinical guidelines recommend thoracic escharotomy in respiratory compromise, rising ventilatory pressures, or diminished bilateral air entry, emphasizing the importance of timely surgical decision-making in close coordination with critical care teams. Thoracic surgeons contribute substantially to the broader continuum of burn care through advanced airway management, including early intubation, bronchoscopy, and tracheostomy when inhalation injury is suspected or confirmed (Bagley et al., 2022). In the long term, their chest wall reconstruction expertise is vital for restoring respiratory mechanics and preventing disabling sequelae. Taken together, these contributions underscore that thoracic surgery must be recognized as a central component of multidisciplinary burn care, working alongside plastic surgery, anesthesiology, and intensive care to reduce morbidity and mortality.

Inhalation injury further compounds the complexity of burn management, as it worsens outcomes through airway edema, mucosal damage, and heightened risk of acute lung injury (Walker et al., 2015; Foncerrada et al., 2018). Fiberoptic bronchoscopy remains the gold standard for diagnosis and severity assessment, guiding clinical decisions regarding early intubation and ventilatory support (You et al., 2014; Walker et al., 2015). In a prospective observational study, Jones et al. (2013) demonstrated that early bronchoscopy-derived markers in bronchial washings—such as elevated IL-10 and reduced IL-12p70—were independently associated with more severe lung injury, irrespective of burn size or concurrent infections. These findings reinforce the value of thoracic surgery teams in managing inhalation injuries, particularly in specialized centers with capacity for advanced airway interventions and bronchoscopy.

Burns involving the thoracic region pose special challenges: severe chest wall involvement may limit ventilation by restricting chest expansion. At the same time, deeper thermal injuries or associated trauma may extend into pleural or pulmonary spaces. Long-standing burn scar contractures of the chest wall are shown to cause restrictive pulmonary patterns, and surgical release of contracture improves pulmonary function in some patients (Sulli et al., 2019). Though direct reports of thoracic exploration in acute burn settings are less common, the functional impairments from chest wall contracture and the potential for intrathoracic complications underscore the importance of having thoracic surgical expertise in multidisciplinary burn units. Thoracic surgeons are vital when escharotomy, debridement, or reconstruction of chest wall integrity is required.

The pattern of burn cases across children and work-related injuries was similar to what earlier research has shown. For example, Loos et al. (2020) found that pediatric burns account for a large share of emergency visits and are often handled as forensic cases. Ferguson et al. (2020) reported similar results, pointing out that most burns in children under the age of five were connected to neglect or abuse. This highlights how vital the emergency departments are in detecting and responding to such cases. In another study, Hermeted et al. (2021) looked at hospital discharge records to better identify burns caused by abuse.

On the other hand, occupational burns were more common in adults, mostly linked to industrial exposure, although few studies addressed this area. According to existing studies, identifying life-threatening pediatric burns and developing clinical strategies for emergency management are essential to reduce mortality and morbidity and ensure effective use of resources.

Our study also found that burn cases were most frequent on Mondays and between 09:00 and 15:00.

This provides valuable insights for planning resource use and management strategies in emergency departments.

Strengths and Limitations

The strengths of this study are its large sample size and broad scope, despite limited details on demographic and temporal data. Its rich dataset, including clinical, procedural, and temporal information, significantly contributes to burn epidemiology and supports emergency burn management.

However, the dataset did not include total body surface area (TBSA), burn degree, or mortality and morbidity data. Inadequate coding, misclassifications, and the retrospective design are also limitations. Still, this study contributes to understanding the epidemiology of burn injuries presenting to emergency services and to strategies for burn management.

Another limitation of our study is the underrepresentation of inhalation injuries and combined thoracic burn complications (burn-related hemothorax, pneumothorax, and open thoracic wounds). These injuries are clinically important but were not reliably captured in hospital databases due to insufficiently specific ICD coding. As a result, the contribution of thoracic surgery in such scenarios may be underestimated in our dataset, despite its well-established role in multidisciplinary burn care.

CONCLUSION

This study analyzed clinical and temporal characteristics of burn patients admitted to the emergency department over a five-year period. Findings showed that small children are at higher risk of burn injuries, that cases increase in summer, and that gender differences appear at later ages. These results are consistent with earlier studies. The study also revealed the generalization of diagnosis codes.

In addition, the results emphasize that thoracic surgery plays a pivotal role in the management of chest wall burns. Severe circumferential thoracic injuries may compromise ventilation and require life-saving escharotomies, while complex cases involving pleural or pulmonary structures demand thoracic surgical expertise. Beyond the acute phase, thoracic surgeons also contribute to airway management in inhalation injuries and chest wall reconstruction during long-term recovery. Incorporating thoracic surgery as an integral part of multidisciplinary burn teams is essential for reducing morbidity and mortality, ensuring functional respiratory outcomes, and strengthening the overall quality of burn care.

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