

Burns injury characteristics and outcomes at lautoka hospital, fiji

Rahul Krishna Reddy^{a,*}, Arun Murari^b, Akhtar Ali^c, Ronal Kumar^d, Livai Lutunaika^d,
Abhay Choudhari^b, Swastika Devi^e, Famiza Kulsum^f

^a Surgical Registrar at Lautoka Hospital, Lautoka City, Fiji

^b Associate Prof. Surgery at Fiji National University, Lautoka City, Fiji

^c Consultant Surgeon/HOD at Lautoka Hospital, Lautoka City, Fiji

^d Consultant Surgeon at Lautoka Hospital, Lautoka City, Fiji

^e Medical Intern at Lautoka Hospital, Lautoka City, Fiji

^f Dietitian at Lautoka Hospital, Lautoka City, Fiji

ARTICLE INFO

Keywords:

Burns
Characteristics
Outcomes
Fiji

ABSTRACT

Background: Burns injury are a global public health problem and one of the leading causes of morbidity and mortality. However, there is no published literature available from Lautoka Hospital in Fiji that assessed the characteristics and outcomes of burn patients.

Objective: The aim of this study was to explore sociodemographic and clinical characteristics, medical care and outcomes of burn injury patient at Lautoka Hospital in order to gain deeper insights into burns related issues and improve burns care at the hospital.

Method: A retrospective cross-sectional study was conducted between January 1st 2020 and June 30th 2024 at Lautoka Hospital in Fiji. Data were analysed using SPSS version 25. The association between independent variables and outcomes was assessed using Chi-square test.

Results: Study population included 267 patients predominately male (57 %). Majority of the patients (59 %) were aged below 10 years. Most of the burns occurred at home (92 %). A significant proportion of patients (64 %) had burns affecting multiple regions with the lower extremities being the most commonly affected area. Partial thickness burns were observed in 87.5 % of patients. The majority of patients (55 %) had a total body surface area (TBSA) < 10 % affected by burns. Normal saline (39 %) and Paracetamol (93 %) were most commonly used intravenous fluid and analgesic respectively. Most patients (93.5 %) underwent daily hydrotherapy while 26 % required surgical interventions. The median length of hospitalisation was 7.4 days. Wound infection occurred in 25 % of patients and the mortality rate was 10 %.

Conclusion: This study provides deeper insights into burn related issues in order to reduce the incidence and morbidity of burn injury, and improve care. This study is single centred and conducted retrospectively thus limiting exploration of additional associations. A multicentred prospective study is recommended.

1. Introduction

Burns are a global public health problem, accounting for an estimated 180,000 deaths annually, with the majority of these occurring in low- and middle-income countries [1,2,3,4,5,6,7,8,9]. A burn is defined as an injury to the skin or other organ tissue by scald, flame, electricity, chemical or thermal contact [10,11,12]. A burn wound is complex and may span multiple anatomical areas as well as differing depths in

different areas as characterized by the Jackson Burn model. [10,11,12].

A population-based study conducted in Fiji in 2012 revealed burns injury annual incidence rate of 17.8/100,000 population, and mortality rate of 3.4/100,000. Most (92.2 %) burns occurred at home, and 85.3 % were recorded as unintentional. Burns were disproportionately higher among I-taukei children compared to children of Fijian of Indian descent while the opposite trend was observed in adulthood [2].

A retrospective study conducted at Lautoka Hospital in 2016 on

* Corresponding author.

E-mail addresses: ratu.rkr@gmail.com (R. Krishna Reddy), arun.murari@fnu.ac.fj (A. Murari), aali@aspenmedical.com.fj (A. Ali), k.ronal@icloud.com (R. Kumar), llutunaika@aspenmedical.com.fj (L. Lutunaika), abhaychoudhari@gmail.com (A. Choudhari), swastikadevi37@gmail.com (S. Devi), fkulsum@aspenmedical.com.fj (F. Kulsum).

<https://doi.org/10.1016/j.burnso.2024.100384>

Received 9 October 2024; Received in revised form 23 October 2024; Accepted 18 November 2024

Available online 29 November 2024

2468-9122/© 2024 The Author(s). Published by Elsevier Ltd. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

childhood burns revealed 178 burn admissions during the study period, most involving less than 20 % of body surface area (BSA). Of these 39.3 % were children aged 5 years or younger with a mean age of 19.8 months. The gender distribution showed that 67.1 % were male and 32.9 % were female. In terms of ethnicity 70 % were Itaukei, 25.7 % were Fijian of Indian descent and 4.3 % were of other ethnicities. Scald burns were most common cause of injury accounting for 97.1 % of the cases [3].

The aim of this study was to explore the sociodemographic and clinical characteristics, medical care and clinical outcomes of burn injury patients at Lautoka Hospital, in order to gain deeper insights into burn related issues and improve burn care at Lautoka Hospital which is a non-burns specialist centre.

2. Method

2.1. Study setting and period

This study was conducted in the Burns Unit of Lautoka Hospital located in Lautoka city, in the Republic of Fiji Islands. The 305-bed Lautoka Hospital serves more than 330,000 people living in the western division. It also functions as a teaching hospital with affiliations to the Fiji National University (College of Medicine, Nursing & Health Sciences) and The University of Fiji (Umanand Prasad School of Medicine & Health Sciences). Data were collected from January 1st 2020 to June 30th 2024.

2.2. Study Design and population

This hospital based retrospective cross-sectional study includes all patients admitted to the Burns Unit of Lautoka Hospital between January 1st 2020 and June 30th 2024. Patients who left against medical advice, had incomplete medical records, and were transferred to other medical facilities were excluded from this study.

2.3. Data collection Instruments and Techniques

The names and National Health Number (NHN) of all patients admitted to the Burns Unit of Lautoka Hospital from January 1st 2020 to June 30th 2024 were collected from the burn's unit register. The list of participants was then submitted to the Medical Records department for folder retrieval. A data collection questionnaire was developed and modified after reviewing various burns guidelines and studies. To ensure data quality and maintain confidentiality, data collection was conducted solely by the primary investigator only.

2.4. Data analysis and Presentation

Data were collected and entered into Microsoft Excel and analysed using SPSS version 25. Descriptive statistics were presented as both frequencies and percentages. The association between several independent variables and outcomes was assessed using Chi-square test analysis. A 95 % confidence interval and a P value of < 0.05 were considered significant in all computations.

2.5. Ethical Considerations

Ethical clearance was obtained from Fiji Human Health Research and Ethics Review Committee (FNHRERC Number: 12/2024) and Lautoka Hospital HCF Research Unit. Since the data is retrospective, the requirement for patient informed consent to review medical records was waived by the committee. The confidentiality of the study population was ensured by excluding any personal identification information.

3. Results

3.1. Sociodemographic characteristics

The study population consisted of 267 patients from the Burns Unit registry, with 57 % being male and 43 % female. The majority (59 %) of patients were under the age of 10. The median age was 9 years (IQR 1–10). Among the patients, the majority (62 %) were I-taukei, followed by those of Fijian of Indian descent (36 %). Most patients (36 %) resided in Lautoka City. Regarding the location of burns injury, the majority (92 %) occurred at home. (Table 1).

3.2. Clinical characteristics

3.2.1. Etiology of burn & time to seeking medical care

The most frequent cause of burn was scald (67 %) followed by flame (29 %). The majority (92 %) of the scald burns were caused by hot water or milk, while most (47 %) of flame burns due to clothes catching fire while cooking or burning rubbish. The majority (80.5 %) of patients sought medical attention within 12 hours of sustaining a burn injury. The median time to seeking medical care after sustaining burn was 7.45 hours (IQR, 0–12). Among the patients, 22 % used herbal medicine before seeking medical care. (Table 2). There was no significant association between use of herbal medicines prior to seeking medical care and the time to seek medical attention ($P > 0.05$).

3.2.2. Extent and Degree of burns injury

Among the patients, majority (87.5 %) were assessed with second degree/ partial thickness burn, followed by third degree/ full thickness burn (8 %). Most (96 %) of total body surface area (TBSA) was estimated using Lund & Browder Chart. The majority of the patients (148, 55 %) had a TBSA burn < 10 %. Patients with flame burns had a higher TBSA when compared to those with scald burns (Table 3).

3.2.3. Anatomic site of burns injury

The majority of patients had burns in more than one region (63.75 %). Extremities (27.5 %) were the most commonly burned anatomic site, of which lower extremities accounted for 17.5 %. The posterior trunk

Table 1
Sociodemographic Characteristics.

Variable	Frequency (%)
Gender Distribution	
Male	153 (57 %)
Female	114 (43 %)
Total (N)	267
Age Distribution	
<1 years	29 (11 %)
1–10 years	127 (48 %)
11 – 20 years	19 (7 %)
21 – 30 years	27 (10 %)
31 – 40 years	25 (9 %)
41 – 50 years	22 (8 %)
>50 years	18 (7 %)
Ethnic Distribution	
I-taukei	167 (62 %)
Fijian of Indian descent	95 (36 %)
Others	5 (2 %)
Geographical Distribution (Western Division)	
Nadroga / Navosa	29 (11 %)
Nadi	71 (27 %)
Lautoka	97 (36 %)
Ba	34 (13 %)
Tavua	19 (7 %)
Rakiraki	17 (6 %)
Place of Burn Injury	
Home	245 (92 %)
Workplace	17 (6 %)
Others	5 (2 %)

Table 2
Etiology and Time to Seek Medical Care.

Cause of Burns Injury	Frequency (%)
Scald	180 (67 %)
Flame	77 (29 %)
Electricity	5 (2 %)
Contact	–
Chemical	5 (2 %)
Time to Seek Medical Care (Hours)	Frequency (%)
<12 h	215 (80.5 %)
12 – 24 h	16 (6 %)
24 – 36 h	6 (2.25 %)
36 – 48 h	–
48 – 72 h	8 (3 %)
>72 h	22 (8.25 %)
Use of Herbal Medicine	59 (22 %)

Table 3
Burns Assessment.

Degree of Burn	Frequency (%)
Superficial Burn	12 (4.5 %)
Partial Thickness Burn	234 (87.5 %)
Full Thickness Burn	21 (8 %)
Total Body Surface Area (TBSA%)	Frequency (%)
<5%	43 (16 %)
5 – 10 %	105 (39 %)
11 – 15 %	48 (18 %)
16 – 20 %	28 (11 %)
21 – 30 %	18 (6.75 %)
31 – 40 %	7 (2.5 %)
>40 %	18 (6.75 %)
Method of Estimation	Frequency (%)
Lund & Browder Chart	257 (96 %)
Not Documented	10 (4 %)

(1.25 %) and genitalia (1.25 %) were the least burned sites. There was no significant difference in terms of patient’s gender and burn site ($P > 0.05$) (Figure 1).

3.3. Medical care

3.3.1. Fluid resuscitation and Analgesia

Intravenous fluids using Parklands formula were given to 42 % of the burn patients. The most frequently used fluid was normal saline (39 %) followed by Hartmann’s solution (33 %). All patients were administered analgesics for pain control. The most frequently administered agent was Paracetamol (93 %) followed by Morphine (81 %). The majority of the patients were administered the combination of Paracetamol and Morphine. Tetanus anti-toxoid for the prevention of tetanus was given to

only 3 (1.25 %) of the patients. (Table 4).

3.3.2. Wound care and Hospitalization

Antibiotic treatment was given to 45 % of burn patient (Table 5). The majority of patients (93.5 %) had undergone hydrotherapy once daily as part of wound care regime. Paraffin and Neomycin dressing were used for majority of the patients (95 %). Wound infection was prevalent among 25 % of the burn patients; the most common organism cultured from wound swab was *Pseudomonas aeruginosa* (27 %) followed by *Acinetobacter baumannii* (22 %) (Figure 2). Among the patients, 26 % required surgical procedures, while 8 % required ICU level care (Figure 3). Dietician and physiotherapist review were done for 90 % and 55 % of the patients respectively. The median length of stay for all patients was 7.4 days (IQR, 6–10) (Figure 4). There is no significant association between the use of herbal medicine prior to seeking medical attention and the development of wound infection ($P > 0.05$).

3.4. Outcome of treatment

Of the 267 admitted patients, 229 patients were discharged without complications and 27 patients died (10 %); majority died due to acute respiratory distress syndrome or multi organ dysfunction. Flame burns with a higher TBSA and greater depth were associated with a higher mortality rate (89 %) (Table 6).

4. Discussion

This study showed high incidence of burns injuries (59 %) among children under the age of 10, predominately male. While most of the burn injuries (92 %) occurred at home, parental negligence can be a major factor attributing to high incidence rate among children. Since children lack stability and awareness of hazardous environment, parental supervision is essential for burn injury prevention. As children gain locomotor and manipulative skills and engage in more physical activity with age, it is imperative to educate and create awareness during this development phase. These findings are similar to existing literature thus highlighting the need for creating effective awareness for the target population [3,4,5,6,7,8]. Burn prevention should be part of education curriculum and more campaigns and workshops are needed to educate children. Social media can be an efficient mode of creating awareness for children provided the content is easy to understand and not too sophisticated.

To add on, scald burns (67 %) were the most common cause of burn injuries followed by flame burns (29 %). The etiology is similar to studies done in other countries however the etiological distribution differs [4,5,6,7,8,9]. In our setting, scald burn was mostly caused by boiling water or milk (92 %) while flame burn injury were mostly the result of clothes catching fire while cooking or burning rubbish; deliberate self-harm accounted for 28.5 % of flame burns. The majority (80.5

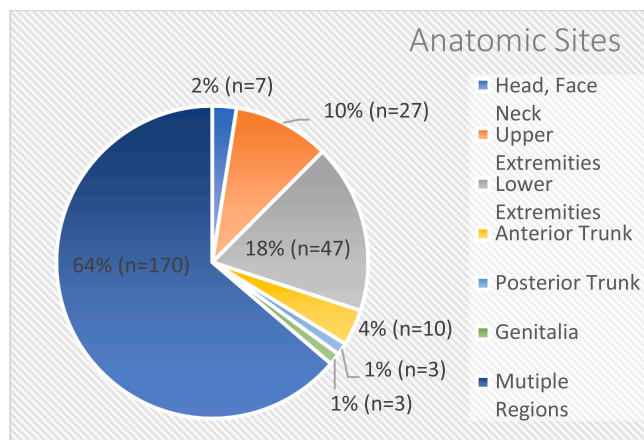


Fig. 1. Anatomic Sites of Burn among Patients.

Table 4
Patterns of IV Fluids, Analgesia and Tetanus Anti-Toxoid used among Burn Patient.

Intravenous Fluids	Frequency (%)
Hartman’s Solution	88 (33 %)
Normal Saline	105 (39 %)
D-Saline	5 (2 %)
Combination	69 (26 %)
Analgesics	
Paracetamol	249 (93 %)
Morphine	216 (81 %)
Tramadol	12 (4.5 %)
Ibuprofen	23 (9 %)
Fentanyl	12 (4.5 %)
Tetanus anti-toxoid (TAT)	
Administered	3 (1.25 %)
Not Documented	264 (98.5 %)

Table 5
Antibiotics Administered.

Antibiotics	Frequency (%)
Flucloxacillin	105 (39 %)
Gentamicin	81 (30 %)
Metronidazole	14 (5 %)
Ciprofloxacin	11 (4 %)
Ceftriaxone	8 (3 %)
C0-Trimazole	5 (2 %)
Chloramphenicol	5 (2 %)

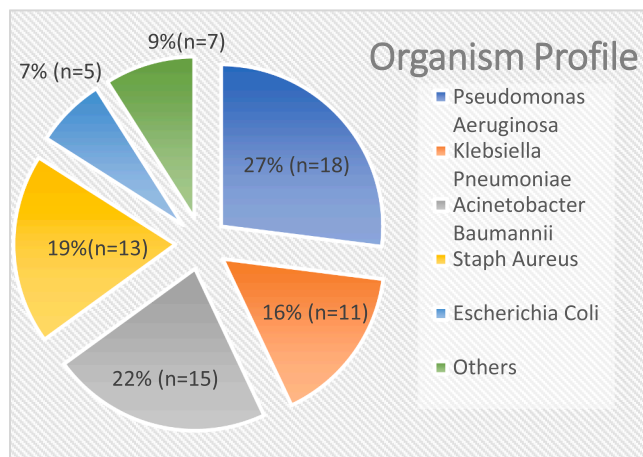


Fig. 2. Wound Swab Organism Profile.

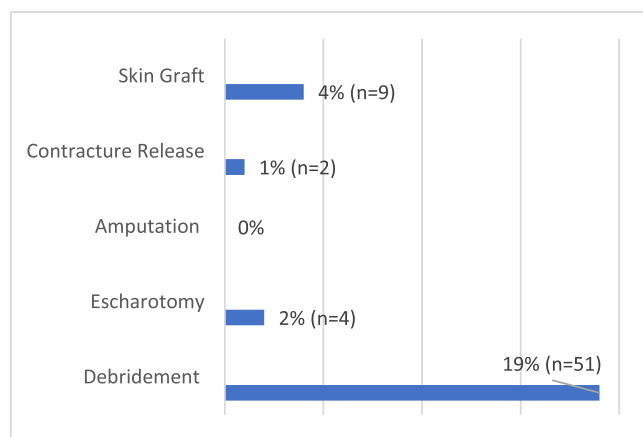


Fig. 3. Proportion of Surgical Procedures.

% of patients sought medical attention within 12 h of occurrence of burn injury, highlighting positive attitude towards medical care provided in our setting.

The present study showed that lower extremities were the most commonly burned anatomic site, however majority of our patients (64 %) sustained burn at multiple regions. Partial thickness was the commonest depth of burn seen (87.5 %) and the median interquartile range of TBSA was less than 20 %. These findings were consistent with similar studies [2,3,4,5,6,7,8]. This study also reveals that mortality is highest in burn patient with full thickness burns (56 %) and with TBSA of more than 40 % (59.5 %). There might be difference in mortality compared to other studies due to difference in sample size, causative agent, admission criteria, early diagnosis and management of burns injury [4,5,6,7,8].

Furthermore, in this study 42 % of patients received intravenous fluid resuscitation with normal saline being the most frequently used fluid. Fluid resuscitation is needed when the burned surface area is > 20

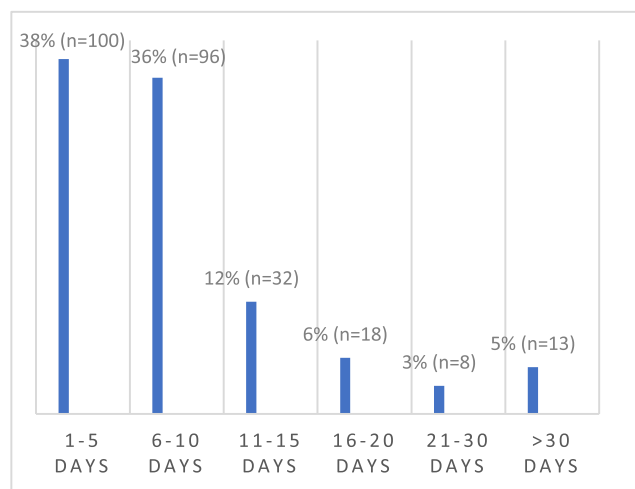


Fig. 4. Distribution Hospitalization Length.

Table 6
The Association of Etiology, Degree of Burn, TBSA% Vs Mortality.

	Frequency (%)	Mortality (%)
Etiology		
Scald	180 (67 %)	3 (11 %)
Flame	77 (29 %)	24 (89 %)
Electricity	5 (2 %)	0
Chemical	5 (2 %)	0
Degree of Burn		
Superficial Burn	12 (4.5 %)	0
Partial Thickness Burn	234 (87.5 %)	12 (44 %)
Full Thickness Burn	21 (8 %)	15 (56 %)
TBSA%		
<5%	43 (16 %)	0
5 – 10 %	105 (39 %)	0
11 – 15 %	48 (18 %)	1 (3.5 %)
16 – 20 %	28 (11 %)	2 (7 %)
21 – 30 %	18 (6.75 %)	4 (15 %)
31 – 40 %	7 (2.5 %)	4 (15 %)
>40 %	18 (6.75 %)	16 (59.5 %)

% TBSA in adults or > 10 % TBSA in children [13,15]. Fluid volume was calculated using parklands formula [4 ml x weight kg x %TBSA burn], however current EMSB guideline recommend the use of modified parklands formula [3 ml x weight kg x %TBSA burn] for both adults and children to avoid complications associated with over resuscitation [13]. Normal saline use is not recommended as first choice for fluid resuscitation in burn patients due to its effects on kidneys, which may lead to hyperchloremic metabolic acidosis. Hartmann’s solution is recommended as first choice in resuscitation of burn patients [12,13,15]. Children (under 16 years) should also receive maintenance fluid as they are at risk of hypoglycaemia due to limited glycogen storage. The recommended maintenance fluid choice is 0.9 % normal saline with 5 % dextrose [12,13,15]. In this study analgesics were prescribed for almost all patients for pain management. The most frequently used drug was paracetamol (93 %) followed by morphine (81 %). Pain management is an essential part of management of burn patients however choice of analgesic varies depending on the availability of different drugs and pain management guidelines [4,5,6,7,8,16]. Tetanus prophylaxis was only given to 1.25 % of patients however it is recommended in patients with no documented history of primary vaccination or if the last dose administered was more than 5 years ago [13].

Administration of antibiotics is recommended only when there are signs of systemic infection, however this study showed that 39 % of patients were started on prophylactic antibiotic [13]. This practice needs to be addressed to prevent antimicrobial resistance in the future.

Hydrotherapy was effective in the management of burn wounds as only 26 % of the patients required surgical intervention. Dietitian review was done 90 % of the patients which highlights the importance of nutritional support in treating burns and its significance in improving patient survival and reduction of complications such as infection [12,13,17]. Wound infection was prevalent among 25 % of the burn patients; organism profile from wound swabs shows high prevalence of nosocomial organisms which need to be addressed to reduce infection rate.

In this study, most of the patients (86 %) were discharged without complications. The mortality rate of this study was 10 % which was higher in comparison to other studies [4,5,6,7,8]. The difference in outcome when compared to other studies can be attributed to the fact that our hospital is not a burn specialist centre and despite providing the best treatment possible, clinical outcomes can be improved by specialist management.

Limitations

This study was the first detailed report of burn patients from our burn's unit. However, this study was conducted retrospectively thus unavailability of some variables in patient's medical records limited our ability to explore additional associations and correlations. Furthermore, this study was from a single institution, thus finding from this study cannot be fully generalized. Lastly excluding patients who were referred out of the unit means we have missed recording some of the more serious burn injuries who presented to the hospital.

5. Conclusion and Recommendation

Burn is a major public health burden, especially among children. While most of the burn injury characteristics and outcomes are similar to those seen in other resource limited centres, we need to improve adherence to protocols of regarding fluid resuscitation and pain management. To mitigate and reduce burn occurrence it is imperative to educate the general population about burn prevention strategies and appropriate responses to burn incident. Implementing emergency management of severe burns course (EMSB) to all health professionals is essential in improving the quality of care of burn patient. The need for a burns specialist centre where burn patients are managed by plastic surgeons is essential to improve treatment outcomes as currently burn patients are managed in a non-burn's specialist centre (Lautoka Hospital) by general surgeons.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Acknowledgement

My sincere thanks to the medical records staff at Lautoka Hospital for timely retrieval of case folders.

References

- [1] WHO. Burns 2023 [available from: <https://www.who.int/news-room/fact-sheets/detail/burns>].
- [2] Taoi M, Wainiqolo I, Kafoa B, et al. Characteristics of fatal and hospital admissions for burns in Fiji: a population-based study (TRIP Project-2). *Burns* 2012;38(5): 758–62. <https://doi.org/10.1016/j.burns.2011.11.005>.
- [3] Murari, Arun & Ali, Akhtar. (2016). Childhood Burns Requiring Hospitalization in Western Fiji: A Retrospective Study.
- [4] Abazari M, Ghaffari A, Rashidzadeh H, Badeleh SM, Maleki Y. A Systematic Review on Classification, Identification, and Healing Process of Burn Wound Healing. *Int J Low Extrem Wounds* 2022 Mar;21(1):18–30. <https://doi.org/10.1177/1534734620924857>. Epub 2020 Jun 11 PMID: 32524874.
- [5] Lelei LK, Chebor A, Mwangi H. Burns injuries among in-patients at Moi Teaching and Referral Hospital, Eldoret. *Kenya The ANNALS of AFRICAN SURGERY* 2011;8: 12.
- [6] Cohen AD, Gurfinkel R, Glezinger R, Kriger Y, Yancolevich N, Rosenberg L. Pediatric burns in the Bedouin population in southern Israel. *ScientificWorldJournal*. 2007;7:1842-1847. Published 2007 Nov 12. 10.1100/tsw.2007.239.
- [7] Almutairi A, Labani S, Alasmari M, Alamri M, Alqahtani A, Albabtain I, et al. Burn Injury Characteristics and Outcomes among Pediatric and Adult Patients Admitted to Ministry of National Guard Health Affairs (MNGHA) Hospitals in Saudi Arabia. *Burns Open* 2023;7. <https://doi.org/10.1016/j.burnso.2023.09.002>.
- [8] Alemayehu S, Afera B, Kidanu K, Belete T. Management Outcome of Burn Injury and Associated Factors among Hospitalized Children at Ayder Referral Hospital, Tigray, Ethiopia. *Int J Pediatr* 2020;9136256. <https://doi.org/10.1155/2020/9136256>.
- [9] Hong R, Perkins M, Gabbe BJ, Tracy LM. Comparing Peak Burn Injury Times and Characteristics in Australia and New Zealand. *Int J Environ Res Public Health*. 2022; 19(15):9578. Published 2022 Aug 4. 10.3390/ijerph19159578 <https://www.sciencedirect.com/science/article/abs/pii/S0305417918310489>.
- [10] Warby R, Maani CV. Burn Classification. [Updated 2023 Sep 26]. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan-. Available from: <https://www.ncbi.nlm.nih.gov/books/NBK539773>.
- [11] Geoffrey P Dobson, Jodie L Morris, Hayley L Letson, Pathophysiology of Severe Burn Injuries: New Therapeutic Opportunities From a Systems Perspective, *Journal of Burn Care & Research*, Volume 45, Issue 4, July/August 2024, Pages 1041–1050, 10.1093/jbcr/irae049.
- [12] <https://www.uptodate.com/contents/emergency-care-of-moderate-and-severe-thermal-burns-in-adults/print>.
- [13] Emergency Management of Severe Burns (EMSB) course manual, 20th edition 2024.
- [14] American Burn Association [available from: <https://ameriburn.org/resources/burnreferral/>].
- [15] Haberal M, Sakallioglu Abali AE, Karakayali H. Fluid management in major burn injuries. *Indian J Plast Surg* 2010;43(Suppl):S29–36. <https://doi.org/10.4103/0970-0358.70715>.
- [16] Griggs C, Goverman J, Bittner EA, Levi B. Sedation and Pain Management in Burn Patients. *Clin Plast Surg* 2017;44(3):535–40. <https://doi.org/10.1016/j.cps.2017.02.026>.
- [17] Ren Y, Wang L, Zhan J, Liao W, Renchao Hu, Luo J, et al. to 2022, Nutrition, Volume 111, 2023. ISSN 1983;112027:0899–9007. <https://doi.org/10.1016/j.nut.2023.112027>.