International Journal of Medical Science and Clinical Research Studies

ISSN (print): 2767-8326, ISSN (online): 2767-8342

Volume 04 Issue 12 December 2024

Page No: 2383-2387

DOI: https://doi.org/10.47191/ijmscrs/v4-i12-33, Impact Factor: 7.949

Epidemiology of Burn Patients at Bali Mandara General Hospital Treated With Emergency Management of Severe Burns Protocol: A Retrospective Study

Grace Claudia[1], Putu Trisna Utami[2]

[1]Medical Doctor, Faculty of Medicine Udayana University, Denpasar, Bali, Indonesia

[2]Plastic Surgeon, Department of Plastic Reconstructive and Aesthetic Surgery, Bali Mandara Regional Public Hospital, Denpasar, Bali, Indonesia

ABSTRACT

Background Burns are one of the most common injuries resulting from heat or radiation, electricity, and chemicals. Bali Mandara General Hospital is a new government hospital operated in October 2017. The hospital implemented the Ministry of Health Regulation's Guideline which applies the Emergency Management of Severe Burns to manage burns cases.

Aim The current study aims to determine the epidemiological burn patients at Bali Mandara General Hospital**,** and emphasize the importance of burn management strategies.

Methods A hospital-based, single-center, and retrospective study was conducted from November 1st, 2017 to June 30th, 2022 at Bali Mandara General Hospital. Demographic and clinical information were extracted from hospital medical records. Data is collected and analyzed using Microsoft Office Excel and SPSS Statistic version 26. Correlation between ABSI score and length of hospital stay were examined.

Results A total of 142 burn patients were included in this study; including 56 (39,43%) moderate – severe burn patients, 35 (62.50%) are male and 21 (37.50%) female, out of which are 33 (82.5%) patients with burn time-admission gap < 24 hours. The major proportion of burn patients are adults (18-65 years old) - 110 (77.46%) patients with an average age of 27±17.72 years. The most common total body surface area (TBSA) of burn ranged from 1 to 10%. The major proportion of moderate – severe burn patients are adults (42 patients, 38.18%). There were 40 (71.42%) patients undergoing surgical procedure. Scald and flame contributed equally for the amount of moderate to severe burns (21 patients, 37.50%). Average length of hospital stay was 8.3 days, ranging from 3 to 15 days. Seventeen (42.50%) patients have low mortality risk. Spearman's correlation between ABSI score and length of stay resulted in a coefficient of 0.48, indicating a moderate correlation.

Conclusion Scald is the most common cause of burn injury in all burn patients and male dominated in this study. ABSI score and length of stay has positive correlation in our study.

KEYWORDS: Bali, burns, epidemiology, ABSI score, length of stay, outcome

ARTICLE DETAILS

Published On:
16 December 2024

Available on:
https://ijmscr.org/

BACKGROUND

Burn injuries remain a significant global health burden, leading to high rates of mortality, morbidity, and disability, particularly in low- and middle-income countries. Globally, the World Health Organization (WHO) estimates that over 180,000 deaths annually are caused by burns, with the majority occurring in low-income settings due to inadequate access to quality burn care.[1] In these regions, burn injuries are often associated with domestic and occupational accidents, and also a lack of awareness about preventive measures.[2] The epidemiology of burns shows regional variation, reflecting cultural, socioeconomic, and infrastructural disparities. In Southeast Asia, burns are predominantly caused by open flames and scalds, often affecting children and young adults.[3]

Worldwide, there has been a gradual decline in the incidence of severe burn injuries in high-income countries, attributed to improved safety regulations, widespread public education campaigns, and advances in burn care. However, this trend contrasts sharply with low- and middle-income countries, where the burden remains high, exacerbated by inadequate resources and training.[4] Retrospective studies have proven instrumental in understanding the epidemiology of burns and improving intervention strategies.[5]

Bali Mandara General Hospital is a new government hospital operated in October 2017 that provides care for plastic surgery patients, including burn patients. The hospital implemented Ministry of Health's regulation guideline which applies the Emergency Management of Severe Burns (EMSB) protocol during 2017-2022 to manage burns cases, with the goal to optimize treatment outcomes for severe burn cases. The EMSB protocol emphasizes early assessment, resuscitation, infection control, and rehabilitation, significantly improving patient survival and recovery in resource-limited settings. [6,7] This retrospective study aims to analyze the epidemiology of burn patients at Bali Mandara General Hospital treated under the EMSB protocol between 2017 and 2022. By examining trends in patient demographics, causes of injury, and treatment outcomes, the study seeks to provide valuable insights into the effectiveness of the EMSB protocol in a middle-income setting and contribute to the broader understanding of global burn epidemiology.

METHODS AND MATERIALS

A hospital-based single-centered retrospective study was conducted from November 1st 2017 to June 30th 2022 at Bali Mandara General Hospital. The records of all 150 cases with the diagnosis of burn admitted to the hospital were reviewed. Eight records were excluded due to missing data and referral to tertiary care Burn Centre. Demographic and clinical information of burn patients were collected from medical record, including the age, gender, etiology, burn size and depth, burn time-admission gap, treatments, and length of hospital stay. Data is collected and analyzed using Microsoft Excel and SPSS Statistic version 26. Ethical approval was obtained from Health Research Ethics Committee RSUD Bali Mandara Provinsi Bali No:077/EA/KEPK.RSBM.DISKES/2024

The patients were divided into four age groups: under 18 years old, 18–34 years old, 35–65 years old, and over 65 years old. The causes of burns were categorized as flame, scald, electrical, chemical, thermal contact, or sunburn. The size of the burns was measured using the Rule of Nines, and the depth of burns was classified into epidermal, superficial dermal, mid-dermal, deep dermal, and full-thickness burns.

Patients were then grouped based on the severity of their burns: mild, moderate, or severe. The time gap between the burn injury and hospital admission was divided into three categories: less than 8 hours, 8–24 hours, and more than 24 hours. For patients with moderate to severe burns, we calculated the Abbreviated Burn Severity Index (ABSI). We analyzed whether there was a correlation between the ABSI score in moderate to severe burn patients and their length of hospital stay.

RESULTS

A total of 142 burn patients were included in this study. The patients are between 4 months and 71 years of age (mean age 27±17.72years). The majority of burn patients are adults (18-65 years old) - 110 (77.46%) patients; including 42 (38.18%) moderate - severe burns **(Figure 1)**. There are 72 (50.70%) male and 70 (49.30%) female patients **(Table 1)**; including 56 (39,43%) moderate – severe burn patients, 35 (62.50%) of which are male and 21 (37.50%) female **(Table 2)** with 33 (82.5%) patients having burn time-admission gap <24 hours **(Figure 3)**. The most common total body surface area (TBSA) of burn ranged from 1 to 10% in all burns. The major cause of overall burn injury was scald - 61 (42.66%) patients, and flame injury in 38 (26.57%) patients, however in moderate to severe burns, scald and flame contributed equally for the amount of patients admitted (21 patients, 37.50% each) **(Figure 2)**. Out of 56 patients with moderate – severe burns, 40 (71.42%) patients underwent surgical procedure, 3 (5.36%) patients had outpatient treatment, and 13 (23.21%) patients refused treatment. The average age of patients that underwent surgical procedure were 34.94 ± 19.81 years, ranging from 11 months to 69 years. Average length of hospital stay was 8.3 days, ranging from 3 to 17 days. Out of all patients with moderate – severe burns, 17 (42.50%) patients have moderate mortality risk based on ABSI score **(Table 3)**. Spearman's correlation was used to identify the correlation between ABSI score and length of stay, resulting in a coefficient of 0.48, indicating a moderate correlation. In this study, we found that 13 patients refused surgery and hospitalization, with the main reason for declining treatment being financial constraints.

Table 1. Gender ratio, burn size

All Burns	N (%)
Male	72 (50.70)
Female	70 (49.30)
TBSA (%)	**N %)**
1-10	108 (76.06)
11-20	23 (16.20)
21-30	8 (5.63)
31-40	1 (0.7)
41-50	1 (0.7)
51-60	1 (0.7)
61-100	0 (0)

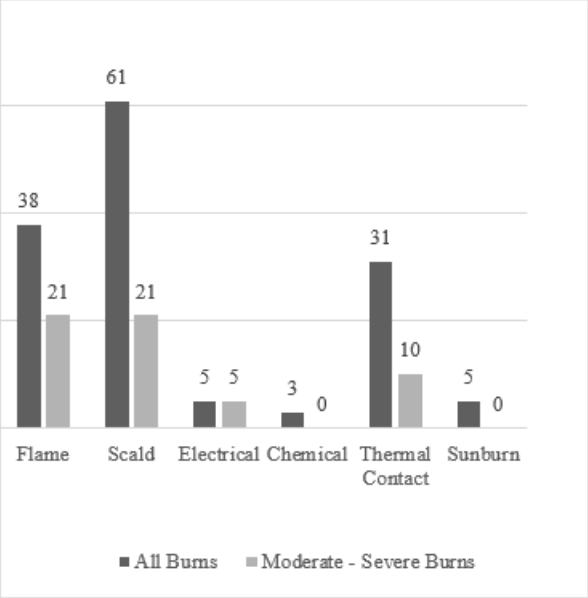

Figure 2. Distribution cause of all and moderate - severe burn patients

Table 2. Moderate-severe burn patients' gender ratio and treatments

Moderate - Severe Burns	N (%)
Male	35 (62.50)
Female	21 (37.50)
Treatments	**N (%)**
Debridement	26 (46.43)
+ PRP Injection	5 (8.93)
+ Tangential Excision	2 (3.57)
+ Escharotomy	5 (8.93)
+ Skin Graft	2 (3.57)
Refused Treatment	13 (23.21)
Outpatient Care	3 (5.36)
Total	56 (100)

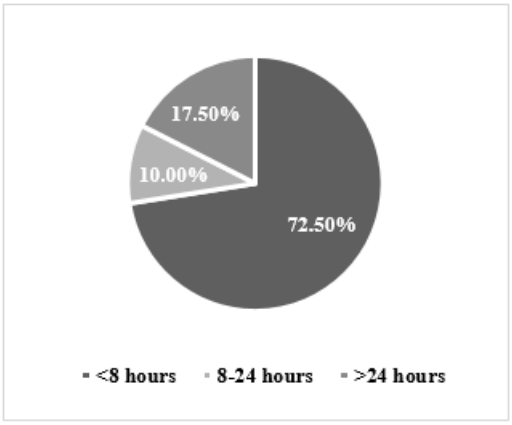

Figure 3. The time gap between the burn injury and hospital admission

Table 3. Moderate severe burn patients' prognosis and length of stay

ABSI burn score (score scale)	N (%)
Very low (2-3)	8 (20.00)
Moderate (4-5)	17 (42.50)
Moderate-severe (6-7)	15 (37.50)
Serious (8-9)	0 (0)
Severe (10-11)	
Maximum (>=12)	
Length of Stay	**N (%)**
<=7 days	13 (32.50)
8-14 days	22 (55.00)
>14 days	5 (12.50)
Total	40 (100)

DISCUSSION

Burn epidemiology provides essential insights into the distribution, causes, and outcomes of burn injuries worldwide. Comprehensive registries and databases have been pivotal in identifying high-risk populations, mechanisms of injury, and gaps in healthcare responses. Research has also highlighted the significance of early intervention, specialized burn care in improving outcomes and reducing mortality rates, and shaping effective burn prevention. The integration of these findings into public health strategies has led to improved burn care systems and heightened awareness, but continuous efforts are needed to face emerging challenges such as religious ceremonies and occupational hazards. Through updated data and evidence, policy makers and healthcare providers may better address the burden of burns globally.[8,9]

The EMSB have been used as the management guideline for burn patients in Bali Mandara General Hospital since the hospital first opened. Burns management requires a group effort of a multidisciplinary team. Initial management

of burn patients in the Emergency unit that apply Primary survey (Airway, Breathing, Circulation, Disability. Exposure), First Aid (fluid, analgesia, tests, tubes), and Secondary Survey (AMPLE History, head to toe examination, tetanus, documentation and transfer, and support) must be done to improve patient's condition.[6]

In our study, most burn patients, including those with moderate to severe burns, were male (50.70% and 62.50%, respectively). This aligns with findings from other studies in Indonesia and abroad.[10,11,12,13] Other research also reported a mean male-to-female ratio of 1.92:1 and 1.68:1, likely due to men being more active and exposed to higher environmental and occupational risks.[8,10,12,14]

In our study, most patients were adults aged 18–65 years (77.46%), consistent with a Brazilian study showing that the 20–59 age group accounted for 49.89% of cases.[13] Scalds were the most common cause of burns, followed by flames, which aligns with findings by Chen et al. (48% and 44%, respectively). However, this differs from other, which reported flames as the leading cause.[11,15,16]

Burns covering 1–10% of the total body surface area (TBSA) were the most common in our study, consistent with a study by Wang et al. (2018). At Bali Mandara General Hospital, 72.5% of patients arrived within 8 hours of injury, and all had cooling treatment performed. Cooling within the first three hours of a burn effectively reduces inflammation, stops the progression of tissue necrosis in the static zone, and provides pain relief. Fluid resuscitation is crucial for survival, and all initial treatments were conducted simultaneously, with careful fluid balance monitoring being essential.

The ABSI score was used to predict mortality risk in burn patients, considering TBSA and full-thickness burns. In our study, 42.50% of patients with moderate to severe burns were in the moderate risk category. We believe that the cooling method played a role in reducing the risk of full-thickness burns and TBSA.[6] However, due to limited data, we could not quantitatively assess this correlation. A moderate correlation was found between ABSI scores and the length of hospital stay.

The average length of stay in this study was 8.3 days (ranging from 3 to 17 days), similar to Mohammed S et al., who reported 1–14 days (83.73%) for patients with second- and third-degree burns. Wang et al. found a median stay of 9 days (range: 5–19 days), and Dargan et al. reported an average of 7.76 days. A study at Jakarta Islamic Hospital Cempaka Putih (2015–2018) found an average stay of 11.24 days, ranging from 1 to 26 days.[16,17,18]

We cannot conclude that a shorter hospital stay indicates successful burn management, as many factors influence the length of stay. The time of discharge needs to be evaluated by a multidisciplinary team, the patient, and their family. This decision depends on wound healing, overall health status, Activities of Daily Living (ADL) independency, mental status, the family's ability to care and the situation at home. Burn patients need adequate nutritional support because of metabolic changes and huge protein breakdowns. Adequate nutrition is important for wound healing (reduces risk of malnutrition, organ dysfunction, infection and death), which is why no fasting is required during the treatment of burn patients in the emergency room as shown in **Figure 4**. Burn wound dressing should resemble normal skin function to provide protection, minimize exudation, reduce pain and swelling, retain moisture and warmth to support the healing process. Conversion to a deeper wound can also be prevented by wound dressing. Infection is one of the biggest cause of patient mortality and morbidity in burn patients. Early surgery on burns aims toward life saving, limb saving, or reducing the risk of complication. Tangential excision, skin grafts, and the use of systemic antibiotics can reduce risk of the infection, inflammation, bacterial colonization, and sepsis, therefore accelerating wound healing and reducing length of stay.[19,20,21]

CONCLUSION

To our knowledge, this is the first study of burns at Bali Mandara General Hospital. The result of this study may may evaluate the effectiveness of The Management of Severe Burns application to manage burn cases, provide fundamental data for burn epidemiology research, and create evidence-based regional data to contribute to these efforts. However, because the data used were collected retrospectively, and due to small sample size from one center, the result of this study is limited in its interpretation of the results and generalizability. Further studies are needed to help establish a standard of burn care in Indonesia.

DISCLOSURE

Funding: This study received no external funding.

Conflicts of interest: There are no conflict of interest.

REFERENCES

I. WHO Media Center Fact Sheets: Burns [Internet]. 2018. Available from: https://www.who.int/news-room/fact-sheets/detail/burns

II. Peck MD. Epidemiology of burns throughout the world. Part I: Distribution and risk factors. *Burns*. 2011;37(7):1087-1100. doi:10.1016/j.burns.2011.06.005

III. Kumar, P., Chirayil, P. T., & Chittoria, R. (2019). Epidemiology of pediatric burns in developing countries. *Pediatrics International*, 61(6), 522-531. DOI:10.1111/ped.13820

IV. Forjuoh, S. N. (2006). Burns in low- and middle-income countries: A review of available literature on descriptive epidemiology, risk factors, treatment, and prevention. *Burns*, 32(5), 529-537. DOI:10.1016/j.burns.2006.04.002

V. Gupta, M., Gupta, O. K., Yaduvanshi, R. K., & Upadhyaya, J. (1993). Burn epidemiology: The Pink City scene. *Burns*, 19(1), 47-51. DOI:10.1016/0305-4179(93)90096-B

VI. Australian and New Zealand Burn Association. Emergency Management of Severe Burns. ANZBA. 2016:18th Edition

VII. Moeloek, Nila Farid. Keputusan Menteri Kesehatan Republik Indonesia Nomor HK.01.07/MENKES/555/2019 Tentang Pedoman Nasional Pelayanan Kedokteran Tata Laksana Luka Bakar. Jakarta: Kementrian Kesehatan Republik Indonesia. 2019

VIII. Smolle C, Cambiaso-Daniel J, Forbes AA, et al. Recent trends in burn epidemiology worldwide: A systematic review. *Burns*. 2017;43(2):249-257. doi:10.1016/j.burns.2016.08.013

IX. Yakupu A, Zhang J, Dong W, Song F, Dong J, Lu S. The epidemiological characteristic and trends of burns globally. *BMC Public Health*. 2022;22(1):1596. Published 2022 Aug 22. doi:10.1186/s12889-022-13887-2

X. Wardhana A, Basuki A, Prameswara ADH, Rizkita DN, Andarie AA, Canintika AF. The epidemiology of burns in Indonesia's national referral burn center from 2013 to 2015. Burns Open. 2017 Oct;1(2):67-73. doi: 10.1016/j.burnso.2017.08.002

XI. Hidayat T, Noer M, Saputro I. Five years retrospective study of burns in DR Soetomo General Hospital Surabaya. Folia Medica Indones 2014;50:123–30.

XII. Wang T, Nie C, Zhang H, et al. Epidemiological characteristics and factors affecting length of hospital stay for children and adults with burns in Zunyi, China: a retrospective study. *PeerJ*. 2018;6:e5740. Published 2018 Oct 3. doi:10.7717/peerj.5740

XIII. Siqueira, D. G. ., M. T. . Aragão, L. G. . Siqueira, T. de S. da . Silva, F. L. C. . Silva, R. de S. M. . Bastos, and E. A. B. B. de . Souza Neto. "Epidemiological Description of Burn Cases Reported in the State of Sergipe During the Period from 2019 to 2023". *Research, Society and Development*, vol. 13, no. 11, Nov. 2024, p. e40131147341, doi:10.33448/rsd-v13i11.47341.

XIV. Chen L, He X, Xian J, et al. Development of a framework for managing severe burns through a 17-year retrospective analysis of burn epidemiology and outcomes. *Sci Rep*. 2021;11(1):9374. Published 2021 Apr 30. doi:10.1038/s41598-021-88507-x

XV. Karki B, Rai SM, Nakarmi KK, et al. Clinical Epidemiology of Acute Burn Injuries at Nepal Cleft and Burn Centre, Kathmandu, Nepal. *Ann Plast Surg*. 2018;80(3 Suppl 2):S95-S97. doi:10.1097/SAP.0000000000001270

XVI. Mohammed Saber KI, 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. Healthc Low-resour S [Internet]. 2024 Feb. 8 [cited 2024 Nov. 28];12(2). Available from: https://www.pagepressjournals.org/hls/article/view/12187

XVII. Dargan A, Wong She RB, Baker P, Damkat-Thomas L. 743 Changes in Epidemiology and Outcomes in a National Burn Centre over 17 Years (2006–2023). *J Burn Care Res*. 2024;45(Suppl 1):223. Published 2024 Apr 17. doi:10.1093/jbcr/irae036.286

XVIII. Wardhana A, Winarno GA, Tanjunga SF, Augiani AS, Zidna AA. The Effect of Early Tangential Excision and Split Thickness Skin Graft In Reducing Length of Stay in Burns Patients in Jakarta Islamic Hospital Cempaka Putih. Jurnal Plastik Rekonstruksi. Indonesia. 2021;8(1):16-21

XIX. European Burns Association. European Practice Guidelines for Burns Care; Minimum level of burn care provision in Europe. 2017 (Version 4); available from: http://euroburn.org/wpcontent/uploads/2014/09/EBA-Guidelines-Version-4-2017-1.pdf

XX. Douglas, Helen E. Burns dressings. Australian Family Physician. Australia. 2017 Mar;46(3)

XXI. Putra ON, Saputro ID, Hidayatullah AYN. A retrospective surveillance of the prophylactic antibiotics for debridement surgery in burn patients. *Int J Burn Trauma*. 2021;11(2):96-104