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BURNS

ORIGINAL ARTICLE

EPIDEMIOLOGY OF BURNS INJURY IN DR. ISKAK GENERAL HOSPITAL TULUNGAGUNG: TWO YEARS (2017-2018) RETROSPECTIVE STUDY

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ABSTRACT

Introduction: Burn injury is one of the leading causes of morbidity and mortality in low and middle-income countries. Yet in Indonesia, the epidemiology of burn is rarely reported. The study aims to obtain the epidemiological characteristics of burn patients in Dr. Iskak General Hospital.
Methods: A retrospective analysis study was used and the medical records of patients with burns admitted at Dr. Iskak General Hospital between January 2017 and December 2018 were collected and analyzed statistically.
Results: A total of 80 patients were involved in this study. The most burn victims fell in the adult group (>18 years old), which was 56.3% (n=45). Children were six times more likely to sustain scald burn than adults (OR=6.75I; CI95% 2.47-18.41), meanwhile adults were three times more likely to sustain flame burn than children (OR=3.643; CI95% 1.186-11.190). Most of burn patients (91.25%) were treated surgically. The median of hospital stay was 8 days. Flame burn was the primary etiology for longer hospitalization and there was zero mortality in this study.
Conclusion: We found that the adult group was at the highest risk of acquiring burns. Scald was the major cause of burns in children, while flame was the main etiology in the adult group that caused severe burn and prolonged hospitalization.
Keywords: *epidemiology, burns injury, Indonesia*

Latar Belakang: Luka bakar merupakan salah satu penyebab utama kecacatan dan kematian di negara berkembang. Namun, studi epidemologi luka bakar di Indonesia masih jarang dilaporkan. Penelitian ini bertujuan untuk mengetahui karakteristik epidemologi pasien luka bakar di RSUD Dr. Iskak Tulungagung.
Metodologi: Metode penelitian yang digunakan adalah analisis retrospektif menggunakan rekam medis pasien luka bakar dari Januari 2017 hingga Desember 2018.
Hasil: Penelitian ini mengumpulkan data dari 80 pasien luka bakar, dengan kasus terbanyak pada laki-laki berjumlah 54 kasus (67.5%), sedangkan pada perempuan 26 kasus (32.5%). Kasus luka bakar paling banyak ditemukan pada usia dewasa (56.3%). Anak memiliki risiko 6x lipat terkena luka bakar air panas dibanding dewasa (OR=6.75I; CI95% 2.47-18.41), sedangkan pasien dewasa lebih berisiko 3x lipat terkena luka bakar api dibanding anak (OR=3.643; CI95% 1.186-11.190). Luas luka bakar terbanyak (51.25%) adalah 0-10% TBSA. Hampir seluruh pasien luka bakar (91.25%) memerlukan tindakan operasi. Rata-rata durasi perawatan adalah 8 hari. Tidak ada pasien yang meninggal pada penelitian ini.
Kesimpulan: Pasien dewasa (>18 tahun) lebih beresiko terkena luka bakar. Air panas merupakan penyebab luka bakar tersering pada anak. Api merupakan penyebab tersering luka bakar pada dewasa, memperparah derajat luka bakar dan memperpanjang durasi perawatan.
Kata Kunci: *epidemiologi, luka bakar, Indonesia*

Conflicts of Interest Statement:
The author(s) listed in this manuscript declare the absence of any conflict of interest on the subject matter or materials discussed.

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INTRODUCTION

Burn is a public health problem throughout the world. Burns cause more than 7.1 million injuries, the loss of almost 18 million disability-adjusted life years (DALYs), more than 180,000 deaths worldwide, and the majority of these deaths occurs in low and middle income (LMIC) countries and almost two-thirds occur in the African and South-East Asia regions.[1] Moreover, burns are ranked 4th among all injuries.[2] The problem of burns is not only causing death, but also leaving patients with lifelong disabilities and disfigurements, often with stigma and rejection, which brings substantial physical, psychological and economic loss.[3-4] The large amount of resources needed to treat burns put a financial burden on the public healthcare system as well.[4] Socioeconomic status, the national culture, social welfare, poor education, poor living conditions, and lifestyle are risk factors associated with burns.[3-6]

According to the World Health Organization, burns are ranked 9th in the overall mortality rank for people aged 5-14 years and the 7th most common injury in the world.[1] The mortality of burn is estimated to be 5% of all injuries, which is nearly a quarter of deaths due to traffic accidents.[7]

Indonesian Ministry of Health in 2014 revealed that burns was ranked 6th in unintentional injuries with a total of 0.7%.[8] The last studies regarding burns in Indonesia were done in Cipto Mangunkusumo General Hospital (2013-2015) and Soetomo General Hospital (2007-2011) burn units as tertiary healthcare providers in a tiered referral system. Both studies showed that the majority of patients were male, flame was the most common cause of burns, mortality caused by burns remain high,[4,9] and inhalation trauma became a major factor on the high number of death caused by flame.[9]

Although burns was considered as a pressing concern in Indonesia, the epidemiology related to burn are scant. There was no report regarding burns in primary or secondary health care provider. This study aims to obtain the epidemiological characteristics of burn patients, to evaluate the quality of treatment in burn patients, and to provide a current picture as a reference in order to reduce mortality, morbidity and disability.

METHODS

The research proposal was presented to the hospital ethical committee and was approved. This was a retrospective analysis study. We evaluated the medical records of all patients with burns admitted at Dr. Iskak General Hospital Tulungagung between January 2017 and December 2018 to obtain demographic characteristics of the study population, which included age, gender, etiology of burns, depth of burns, total body surface area (TBSA), anatomical regions, treatment, length of stay, and mortality rate.

Statistical analysis was performed using IBM SPSS Statistics 23 for Mac. Comparisons between groups were made using Chi-square or Fisher's exact test for categorical variables. P value less than 0.05 was considered statistically significant. Total body surface area (TBSA) was classified into severe (>30%) and mild (≤30%).

RESULTS

There were 80 patients burn in this study. Most of the patients were male, consisting of 54 individuals (67.5%), and the rest, 26 (32.5%), were female, thus showing male to female ratio of 2.1:1. Depending on the age, adults group have the largest number of cases (56.3%), and the rest (43.7%) were in children group (Table 1).

Table 1. Distribution based on age and gender.

Age group	Male	Female	Total	%
≤18 years	25	10	35	43.7
>18 years	29	16	45	56.3
Total	54	26	80	100

Scald burns were the commonest cause of burn injury in our study which accounted for 42 cases (52.5%) (Table 2). Compared to adults, pediatric burned often caused by scald (64.2%) with significant statistical difference (p=0.00). Children have a six times higher risk in scald burns compared to adults (OR=6.75I; CI95% 2.47-18.41). On the other hand, adults were often burned by flame (77.2%) compared to children with significant difference (p=0.03).

Adults have three times higher risk of flame burns than children (OR=3.643; CI95% 1.186-11.190) (Table 2).

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Table 2. Distribution by etiologic agents (age and gender) and Chi Square/Fisher's exact test results.

Etiology	Gender				Age				Total
	Male *n* (%)	Female *n* (%)	*p*	OR	Children *n* (%)	Adults *n* (%)	*p*	OR	*n* (%)
Flame	14 (63.6)	8 (36.6)	0.85	0.7 (0.2-2.2)	5 (22.7)	17 (77.2)	0.03	3.6 (1.1-11.1)	22 (27.5)
Scald	27 (64.2)	15 (35.7)	0.68	0.7 (0.2-1.8)	27 (64.2)	15 (35.7)	0.00	6.7 (2.4-18.4)	42 (52.5)
Electric	12 (100)	-	0.00	0.7 (0.6-0.8)	2 (16.7)	10 (83.3)	0.05	0.1 (0-0.9)	12 (15)
Chemical	-	1 (100)	0.32	1.0 (0.9-1.1)	-	1 (100)	0.56	1.0 (0.9-1.0)	1 (1.2)
Contact	1 (33.3)	2 (66.7)	0.24	0.2 (0-2.6)	1 (33.3)	2 (66.7)	0.59	0.6 (0-7.2)	3 (3.7)
Total	54 (67.5)	26 (32.5)			35 (43.7)	45 (56.3)			80 (100)

Table 3. Depth of burn

Depth of burn	Male (%)	Female (%)	Children (%)	Adults (%)	Total (%)
Grade I	-	1 (100)	1 (100)	-	1 (1.3)
Grade IIAB	42 (64.6)	23 (35.4)	32 (49.2)	33 (50.7)	65 (81.3)
Grade III	9 (81.8)	2 (18.2)	1 (9.1)	10 (90.9)	11 (13.8)
Unknown*	3 (100)	-	1 (33.3)	2 (66.7)	3 (3.8)
Total	54 (67.5)	26 (32.5)	35 (43.7)	45 (56.3)	80 (100)

*missing medical record data

The majority of burn patients suffered from second-degree burn, which accounted for 65 subjects (81.3%) in all groups. There was no significant difference between the depth of burns and gender (p>0.05). Adults had a tendency to have deeper burns than children (p=0.007). The distribution of depth of burns is presented in Table 3.

More than half (51.25%) of burns patient had TBSA of 0-11%, followed by 11-30% TBSA (42.5%) (Table 4). There was a significant difference between flame burn cases compared to other etiologies and the extent of burns (p=0.01). We found that patients with flame burn had a twelve times higher risk of extensive burn (>30% TBSA) compared with other causes (OR=12.667; CI95% 1.329-120.716).

Extremities were found to be the most common site of burn injuries. Of all patients with burns 47.8% were affected at the extremities, 31.9% at the trunk, 18.4% at the head, and 1.6% at the genitalia (Figure 1).

Table 4. Distribution based on total body surface area.

TBSA	*N*	Percentage (%)
0 s/d 10	41	51.25
11 s/d 30	34	42.5
31 s/d 50	4	5
51 s/d 70	1	1.25
71 s/d 100	-	-
Total	80	100

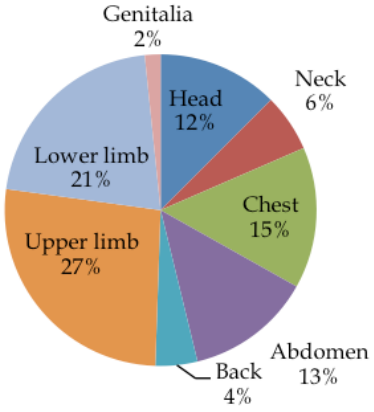

Figure 1. Distribution of anatomical regions

A total of 72 (90%) patients were surgically treated, 7 (8.75%) patient was treated conservatively, and 1 (1.25%) patient rejected the surgical intervention. Most of surgeries were excisional debridement with an estimated proportion of around 68.7% of all procedures, followed by split thickness skin graft (14.1%)

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(Figure 2). The highest number of surgeries done on one patient was 4 operations. Most of burn patients only had one surgery during hospitalization. Burn patients who needed more surgeries were more likely to have longer length of stay (p=0.000).

The median of hospital stay in this study was 8 (1-34) days (Table 5). Flame was the primary etiology of burn patients requiring longer treatment (>8 days), with significant statistical significance (p=0.024). Flame burn patient was three times more likely to have longer hospital stay (>8 days) than the other etiology of burn (OR=3.592; CI95% 1.286-10.034). However, there is no association between length of hospital stay, gender, age, and extent of burn statistically (p>0.05). There was zero mortality in this study.

Table 5. The distribution of hospital length of stay based on gender, age, TBSA, and etiology of admitted burn patients.

	LOS			
	Mean	Median	*n*	%
Gender				
Male	7.46	6.5 (2-17)	54	67.5
Female	9.85	9 (1-34)	26	32.5
Age				
≤ 18 years	7.74	8 (2-16)	35	43.7
>18 years	8.62	7 (1-34)	45	56.3
TBSA				
≤ 30	8.04	7 (1-34)	75	93.8
> 30	11.20	11 (5-17)	5	6.2
Etiology				
Flame	10.59	9 (4-34)	22	27.5
Scald	8.31	8 (1-18)	42	52.5
Chemical	12	12	1	1.2
Contact	3.67	3 (3-5)	3	3.7
Electric	4.50	4 (2-8)	12	15

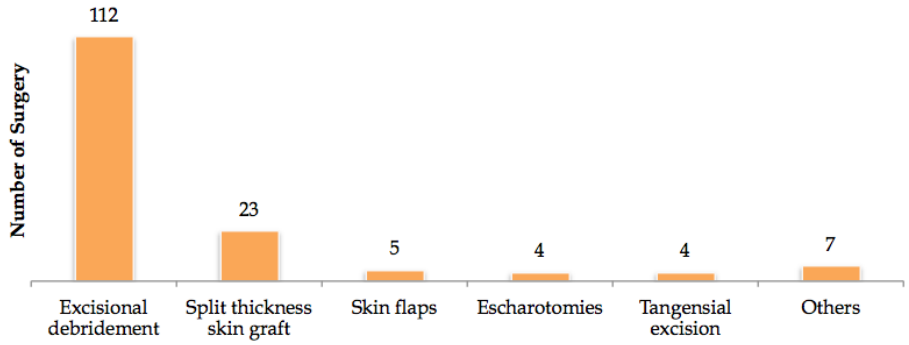

Figure 2. Distribution of types of surgery

DISCUSSION

The present study provides data from Dr. Iskak General Hospital Tulungagung, which is a secondary healthcare provider in a tiered referral system in Indonesia. According to the referral system, our hospital became a reference center around Tulungagung, Trenggalek, Kediri, Ponorogo, Nganjuk and Blitar in all cases, including burn, before being referred to a tertiary hospital. All of burn patients are handled by a plastic surgeon.

In this study, we found that burn more often sustained by male than female with male to female ratio of 2.1:1. This finding was similiar with previous studies in Jakarta[4], Surabaya[9], China[10], and USA.[11] Men are presumed to be more active in occupations with the highest risk of death than woman, thus males will have higher rates of burns.[12] Depending on the age, we found that the largest number of cases were in the working age group (> 18 years old). This finding is consistent with the previous study in Surabaya, which found that most patients admitted to the hospital were at the age of 25-65 years.[9] Study in Nepal also showed that 65.5% of patients were in the adult group[13] as well as in Africa and India.[14-15] High incidence among young adults may be due to the fact that they are generally active and exposed to hazardous environment both at home and work.[15]

The majority of adult patients (77.2%) sustained flame burn and adults had three times higher risk in flame burns compared to children. This finding is similar to a previous study from Australia in 2015, where 44% of burns in adults were caused by flame and explosion[16] as well as in other countries.[17-18] However, flame burns

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occurred the same between female and male in this study. Female involved in household activates like cooking explains the higher incidence of flame burn among this group. Traditional open fire method of cooking in the rural areas and poorly regulated liquefied petroleum gas (LPG) cylinder in urban areas adds to the incidence of flame burn.[13] Meanwhile, the higher proportion of flame burn in mostly adult men is work-related.[17]

In pediatric population, the most common causes of burns were scald and children had six times higher risk in scald injury compared to adults. A study in Australia showed that 57% of burns in children were caused by scald[16] which occurred mainly in domestic circumstances.[15] A systematic review in the East Mediterranean Region showed that in all studies report, scalds are more common than flame injuries amongst children[19] as well as in African Region.[6] This may relate to the activities of children who are still in the domestic sphere, characteristic of mothers (including literacy, education, and age), and the lack of natural instinct to understand the hazard of certain objects.[2,20]

The majority of burn patients suffered from second-degree burn. More than half (51.25%) of the admitted patients sustained 0-11% TBSA burns, followed by 11-30% TBSA (42.5%). This is congruent with previous studies in Jakarta and USA which have 11-30% and 0.1-9.9% TBSA in most of the cases, respectively.[4,11] In our study, we found that 4 out of 5 adults patient who had more than 30% TBSA were caused by flame burn. This finding cause the flame burns patient had twelve times higher risk to sustain severe burn injury (>30% TBSA) compared to the other etiologies. Adults group tends to have deeper burn than children as well. This association was also reported in previous studies.[4,13]

The most frequently injured body region was extremities, which is similar to other studies.[6,21] An average of 1.58 surgeries per patient was found in this study. This finding is lower than the previous study in Jakarta, which has an average of 2.19 surgeries per patient.[4] Excisions debridement was the most commonly performed surgery, followed by split-thickness skin graft. This finding is similar from a study conducted by Wardhana, which found that debridement was the most common procedure in burn patients.[4]

The median of hospital stay in this study was 8 (1-34) days, which is in line with the mean LOS in the previous studies such as Jakarta, China, and USA, with 11 days, 17.3 days, and 9.7 days, respectively.[3,4,11] We found that flame burn was the primary etiology for longer hospitalization. Flame burn patients had three times higher risk of prolonged hospital stay (>8 days) than the other etiologies. This finding is similar to a previous study in Nepal which found that the longer length of hospital stay was associated with the higher %TBSA in flame burns patient.[13] Contratory with a previous study conducted by Wardhana which found the etiology of burns and occupation did not significantly predict LOS.[4] Louise et al. found that factors associated with prolonged hospital stay were burn depth, burn location, presence of infection/sepsis and the necessity for operating theatre visits for either surgical intervention or dressing change.[22]

There was zero mortality in this study. This finding is contrasted with other studies in Indonesia. Study in Soetomo General Hospital burn unit showed that the mortality rate during January 2007- December 2011 was about 10.3% - 17.7%[9] while in Cipto Mangunkusumo burn unit was 24%.[4] Those mortality rate were mostly higher compared to another developing countries.[3,13,19,21] A previous study in Cipto Mangunkusumo burn unit showed that one of the biggest influence factors to the high mortality rate is severe burns. The majority of patients with severe burns (69 of 104 [66.3%])died.[4] Another study revealed the cause of death were septicemia (42.1%), multiple organ failure (31.6%), systemic inflammatory response syndrome (17.6%) and acute respiratory distress syndrome (8.7%).[23] Inhalation trauma became a major factor on the high number of death caused by fire in Soetomo General Hospital. Inhalation trauma was discovered in 96 (14.4%) patients, and there were 46 (48.4%) death cases accompanied with inhalation trauma.[9] In this study, the absence of a death case in burn injury is likely due to prompt service in our hospital. An one-door integrated emergency system called Tulungagung Emergency Medical Service (TEMS), which connects all of the primary healthcare provider (called puskesmas), hospitals, and ambulance around Tulungagung, was likely the determinant factor for preventing death in emergency cases including burn injury. TEMS in the form of an emergency call center, which is headquartered in Dr. Iskak General Hospital, can be access 24 hours a day for general public if they encounter an emergency situation. After receiving the call, the medical team and

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ambulance closest to the scene will be dispatched to give the first aid, and do a primary survey to the patient before they were transferred to our hospital. Fast response time in managing emergency cases ranging from patient transfers, diagnostic and therapeutic enforcement expected to be the key to prevent death from burn injury, even though there was no accurate data nor previous studies that showed correlation between response time and mortality rate in burn patients.

The tiered referral system in Indonesia has a substantial role in the absence of mortality as well. As a secondary healthcare provider, when a patient has severe, extensive burn and requires intensive treatment in a burn unit, we will immediately refer patients to a tertiary healthcare provider.

Further studies are required to extent the population sample, complete medical data including the first-time patient receive the first aid, occupation, patients' socioeconomic background, inhalation injury, comorbidity and investigate the prognostic factors of burn outcomes in order to provide better care and reduce morbidity and mortality rate in burn injury. We believe that our study can ecourage larger epidemiological studies in various health care provider in Indonesia.

CONCLUSION

This study attempted to describe the epidemiological characteristics of burn patients in secondary health care facility in Indonesia and provide the necessary information for the design and implementation of effective prevention programs. We found that working-age population (>18 years) are at highest risk of acquiring burns. Scald was the major cause of burns in children, while flame was the main etiology in the adult group that caused severe burn and prolonged hospitalization.

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