

# A Review of Burns Patients Admitted to the Burns Unit of Hospital Universiti Kebangsaan Malaysia

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## Summary

This is a retrospective review of 110 patients admitted to the Burns Units between October 1999 and November 2001. The aim was to determine the burns pattern of patients admitted to hospital UKM. There was an increasing trend for patients admitted. Female to male ratio was 1:2. Children consisted 34% of the total admission. Children had significant higher number of scald burns as compare to adult ( $p<0.01$ ). Domestic burns were consist of 75% overall admission. Mean percentage of TBSA (total body surface area) burns was 19%. Thirty percent of patients sustained more than 20% of TBSA. Sixty percent of patients had scald burns. Ninety percents of patients with second degree burns that were treated with biologic membrane dressing or split skin graft. Mean duration of hospital stay was 10 days. Over 70% of patients were discharged within 15 days. Overall mortality rate was 6.3%. The patients who died had significantly larger area of burns of more than 20% TBSA ( $p<0.05$ ) and a higher incidence of inhalation injury ( $p<0.02$ ). Hence, this study suggests a need for better preventive measures by the authority to prevent burns related accident and the expansion of the service provided by the Burns Unit.

**Key Words:** Burns, Burns Unit, Malaysia

## Introduction

The Burns Unit in Hospital Universiti Kebangsaan Malaysia started its services in October 1999. This unit provides service for the burn patients around Kuala Lumpur region. There are many epidemiology studies of burns in developed countries<sup>1,2</sup>. However, burns data in developing countries were still limited<sup>3,4</sup>. The study of similar nature was conducted 18 years ago in 1983 at General Hospital, Kuala Lumpur, Malaysia<sup>4</sup>. In

developing countries, awareness of public towards severity and complication of burns would help in seeking early treatment. Burns of more than 20% of TSBA require resuscitation to improve the outcome<sup>1,2</sup>.

The aims of the study were:

1. To determine the number of adult and children admitted
2. To identify the common causes of burns

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3. To determine the percentage of total body surface area (TBSA) involved
4. To determine the degree of burns
5. To determine the method of treatment
6. To determine duration of stay in the Burns Units
7. To determine the morbidity and mortality rates

serious pre-existing medical disorder were considered major burns.

Most patients were treated with collagen membrane (Kollagen™, Eucare Pharmaceuticals Ltd., Chennai, India) dressing that is a biologic transparent collagen membrane. It acts as skin substitute for clean superficial second degree burns.

## Materials and Methods

The study was a retrospective review of 110 patients admitted to the Burns Unit between October 1999 and November 2001. A proforma was used to collect data from patients' record and were stored in Microsoft Access97 database. The data was then analyzed with Statistical Packages for Social Science (SPSS) version 10.01.

In this study children were defined as patients aged 12 years or less. The distribution of adult and children of various races were counted. The common causes of burns were categorized into scald, thermal, electrical and chemical. The degree of burns were assessed clinically. First-degree burn refers to superficial epithelial involvement with skin erythema, pain and no scar formation. Superficial second degree burn involves the superficial layer of the dermis with blistering and blanching on pressure. Deep second degree involves the deeper dermal layer with the skin appearing white, with no blanching on pressure and subsequent scar formation. Third degree burn involves full skin thickness with minimal pain due to the destruction of nerves, and will lead to extensive scarring<sup>5</sup>.

Major burns were defined as full thickness burn of more than 10% of Total Body Surface Area (TBSA) or partial thickness burns of more than 25% in adult or 20% at the extremes of age. The percentage of burns was assessed clinically by using Lund and Browder charting or Rule of Nine. Burns on critical sites such as face, hands, feet, perineum, inhalation injury or patients with

## Results

With reference to Table I, there were 32% female and 68% male. The female to male ratio was 1:2. The ethnic distribution was 42% Malay, 39% Chinese, 15% Indian and 4% others. There was minor differences in distribution between Malay and Chinese. There were 34% children under 12 years old which consists almost one third of the study population. Of this group, 24 children were males and 13 were females with a ratio of 1.8:1. The number of male children were almost twice the number of female children in burns.

Table II depicts the common causes of burns in the study which are categorised into scald (hot oil, water, soup & steam), thermal (kerosene burn, kitchen gas explosion, fire on clothes), electrical and chemical (corrosive agents or acid). The study showed 61% had scald, 27% had thermal, 10% had electrical burns and 2% chemical burns. More than half were burns from scalding injury, whereas chemical burns are rare. However in children, 95% were scald burns by hot water or oil, whereas 5% were thermal burns from fireworks or cigarette lighter induced fires in the bedroom. Children had statistically significant higher numbers of scald burns ( $P < 0.01$ ). Domestic burns were consist of 75% overall admission.

About 66% of patients involved had minor burns (less than 20% TBSA burns). Of this proportion 70% had less than 10% of TBSA burns as shown in Figure 1. Severe burns of more than 20% TBSA

accounts for only 1/3 of admissions. The median TBSA was 19%. The relationship between TBSA and duration of stay was noted in Table III. The numbers of hospital stay increased almost proportionate with TBSA. Mortality was noted among patients with more than 60% of TBSA.

In patients with mixed degree of burns, categorization was based on the larger extent and depth of burn. There were 21 patients with 1st degree, 75 with 2nd degree and 14 with 3rd degree burns. The overall distribution was 19%, 68% and 13% for 1st, 2nd and 3rd degree respectively. Majority of the injuries were due to first and second degree burns with most being second degree burns. There were few third degree burns. There was no relationship noted between degree of burns and duration of stay in the study.

Moreover, the type of surgical and non-surgical treatment would depend on the percentage of TBSA and degree of burns. The main procedures performed were 73 collagen membrane application, 26 split skin graft and 11 escharotomies. The percentage distribution was 66%, 24% and 10% for collagen membrane, split skin graft and escharotomy respectively. Collagen membrane application was the commonest procedure performed.

The duration of patient stay in the Burns Unit is shown in Figure 2. Average stay in this study was 10 days. Seventy percent (77/110) patients were

discharged within 15 days after admission. Of this group, over half (63%) were discharged within 5 days after admission. The remaining 30% stayed more than 15 days up to maximum of 55 days. Patients with severe burns of TBSA more than 20% had significantly longer stay of more than 15 days ( $P<0.01$ ) as shown in Table III.

The admission and mortality rate in the Burns Unit is shown in Figure 3. There was an overall increasing trend noted with two peaks in March 2000 and May 2001. However, there was no seasonal variation found.

The mortality over the 2 years study period was 14 patients with a mortality rate of 6.3%. There was no peak or seasonal variation observed. Twelve (86%) patients who died had inhalation injury caused by fire or explosion. All mortality had TBSA of burns of more than 20% except one who had severe inhalation injury. The patients who died had significantly larger area of burns of more than 20% TBSA ( $P<0.05$ ) and a higher incidence of inhalation injury ( $P<0.02$ ). The main cause of death in the study was inhalation injury resulted in ventilation and pulmonary complication like respiratory failure, adult respiratory distress syndrome and pneumonia. Other causes of death in burns patients were septicemia in overwhelming wound infection, acute renal failure, and cardiac failure as found in Table IV. The same patient who died in the study usually had few contributing causes of death.

**Table I: Demographic Pattern of Burn Patients**

	Malay		Chinese		Indian		Others		Total
	Adults	Child	Adults	Child	Adults	Child	Adults	Child	
Male	21	12	18	7	9	4	3	1	75
Female	5	8	15	3	2	2	0	0	35
Total	26	20	33	10	11	6	3	1	110

**Table II: Causes of Burns**

Cause	Scald	Thermal	Electrical	Chemical	Total
Number	67	30	11	2	110
Percentage	61	27	10	2	100

**Table III: Total Body Surface Area and Average Hospital Stay**

Average hospital stay (days)	7	9	21	24	22	54	*
TBSA (%)	1-10	11-20	21-30	31-40	41-50	51-60	61-100

\* patients died during the stay

**Table IV: Causes of Mortality in Burns Patients**

Causes of Mortality	Number (n)**	Percentage (n/14)
Inhalation injury	12	86%
Septicemia	12	86%
Pneumonia	8	57%
Acute Respiratory Distress Syndrome	8	57%
Disseminated Intravascular Coagulation	6	40%
Acute Renal Failure	6	40%
Myocardial infarction	1	7%
Cerebral vascular accident	1	7%
Severe MRSA wound infection in a child*	1	7%

\* Delay referral to hospital noted

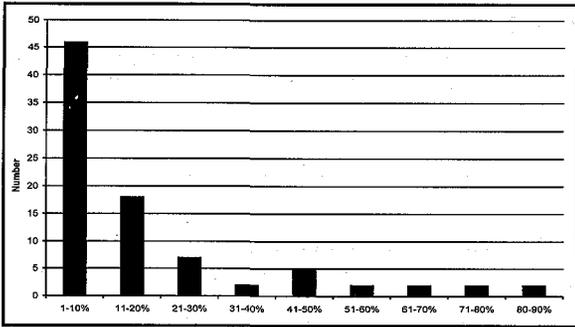
\*\*Patients usually had more than one contributing causes of death

**Table V: Results of other Burns Unit**

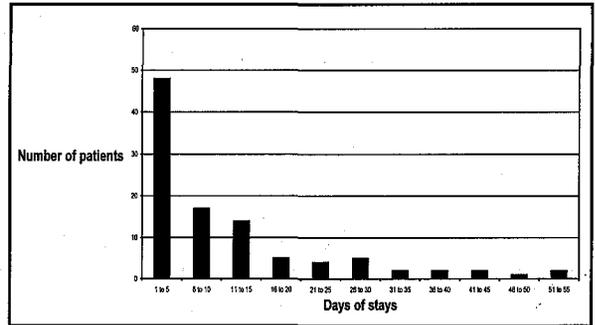
Author & Center	Sample size	Male	Female	Ratio
Ying SY <sup>6</sup> , Paediatric center, Hong Kong	500*	337	213	1.58:1
Ho WS <sup>7</sup> , Hong Kong	1063	678	385	1.76:1
Munnoch DA <sup>1</sup> , Welsh region	324**	297	27	11:1
Mahaluxmivala S <sup>3</sup> , Saudi Arabia	90	46	44	1:1
Carroll SM, Dublin <sup>8</sup> , Ireland	120	67	53	1.26:1
Lyngdorf P <sup>2</sup> , Copenhagen	75	48	27	1.77:1
Pegg SP <sup>9</sup> , Brisbane	182**	173	9	19:1

\* Pediatric sample

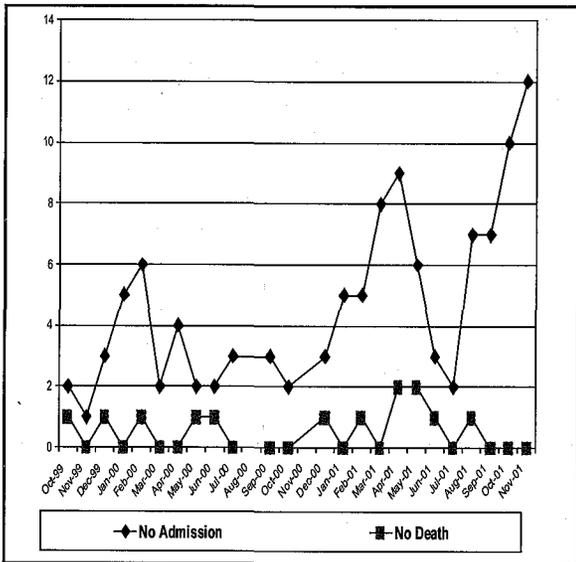
\*\* Industrial workers



**Fig. 1: Total Body Surface Area (TBSA) of burns**



**Fig. 2: Duration of Stay in Burns Unit**



**Fig. 3: Admission and Mortality in Burns Unit**

**Discussion**

The ratio of male to female involved in this study was 2:1 which is comparable to other centers as shown in Table V. This could be due to males being involved in activities that are prone to cause burns. In our study, activities like repairing electrical appliances or cars radiators, factory work that require exposure to chemical agents, rubbish burning, fire fighting, working in petrol stations and oil rig were some of the causes. In females, exposure to burns during cooking and kitchen gas explosion are common causes. Precautions and safety measures taken during

food preparation and in the working environment could help prevent burns.

Ethnic differences may be due to the population living near the hospital consisting of mainly Malays and Chinese with less Indians. The number of children with burns was almost half of the numbers in adult. The injury sustained is often due to domestic accidents in the kitchen. Keeping children away from hot appliances in the kitchen and playing with fireworks might help to reduce the incidence. The male child is more prone to burns than the female child. This could be attributed to the more adventurous nature of the male child. In studies by Malaluxmivala<sup>3</sup> and Muguti<sup>10</sup>, domestic burns accounted for 71% and 90% respectively. Their results were comparable to our study.

Reviewing causes of burns in this study, the commonest was scald burns (61%). The common agents were contact with hot oil while cooking and accidental spillage of hot water from flask. In a study by Ying SY<sup>6</sup>, scalds accounted for 90.4% and thermal burns 8.2% of the population. In a study by Mahaluxmivala<sup>3</sup>, scald and thermal burns together accounted for more than 90% of total study population. In our study thermal burns was the next commonest after scalding burns. Thermal burns were usually due to clothes on fire, kerosene burn during barbecues, petrol or kitchen gas explosions. Inhalation injuries in our study were usually associated with thermal burns.

Inhalation injuries reported by others were 1.6 %, 5.1% and 13.6% by Ying<sup>6</sup>, Ho<sup>7</sup> and al-Shlash<sup>11</sup> respectively. Incidence of smoke inhalation injury varies from 5 to 30% of patients hospitalised with thermal injuries<sup>12</sup>. Electrical burns were seen in patients who were electrician or works in the electric power station. Dubien reported low-voltage (less than 1000 volts) electrical burns were more often in children and high-voltage burns (more than 1000 volts) usually involved adults which causes deep burns<sup>13</sup>. Chemical burns were relatively rare (2%) in our study and were seen in a factory worker who had contact with corrosive chemicals. However, Munnoch reported a higher percentage (23%) of chemical burns among industrial workers in the Welsh region<sup>1</sup>.

The outcome of burns wound would depend on the percentage of burns and degree of burns. The majority of total body surface area burns was to limited between 10-20% of TBSA. However, patients with severe burns accounted for 30% of the admission which suggests the need for a well equipped Burns Unit set up is important. Sarhadi reported burns involved in 1-15%, 16-30% and >31% of TBSA consist of 73%, 14% and 13% total study population respectively<sup>14</sup>. Pegg reported 85% had less than 20% TBSA burns and 2/3 had less than 10% TBSA burns<sup>9</sup>. Their results were similar to our study. Other studies report a mean TBSA burns of 6.8%, 7%, 23% and 24.9% in Ho<sup>7</sup>, Muguti<sup>10</sup>, Mahaluxmivala<sup>3</sup> and Carroll<sup>8</sup> respectively. The above results were comparable to our study.

Most (68%) patients in Burns Unit had second degree burns. They were often admitted for treatment. The first degree burns was commonly treated in outpatient or on the general ward, except pediatric or elderly patients with multiple medical disorders who were admitted. Hence, the number of first degree was small. Muguti<sup>10</sup> reported, 84% of burns were superficial 1st degree or second degree which were very similar to our result of 87% second degree burns.

With regards to treatment in Burns Unit, topical antimicrobial therapy was not commonly used. Topical antimicrobial therapy after wound toileting and blister derroofing may lower rate of infection, but by itself was not treatment of choice<sup>15</sup>. Collagen membrane was commonly used for treating superficial burns. It did not require daily dressing changes, able to prevent fluid loss and provide a protective covering against infection. The majority of patients were treated with collagen membrane in this study, as most had superficial 2nd degree scald burns. Spilt skin graft was used for deep 2nd degree or third degree burns. Early excision and grafting is widely accepted for the treatment of burns, as it minimises infection and hastens wound healing<sup>16, 17</sup>. The study by Tompkin supports early excision and grafting<sup>18</sup>. Escharotomy was performed for circumferential limbs or trunks burns that may compromise circulation.

The duration of stay will depend on the severity of burns or complication that might arise. Seventy percent of admissions were discharged within 15 days as wound healing, recipient or donor site of the split skin graft would had been completed. The remaining 30% patients who stayed more than 15 days were due to a larger area of burns or developed complications of burns. The median number of days of stay were 8, 8, 9 and 16 days were reported by Ying<sup>6</sup>, Munnoch<sup>1</sup>, Ho<sup>14</sup> and Maalluxmivala<sup>3</sup> respectively.

There was an overall increasing trend of admissions that reflects the increasing awareness of the public or health centers regarding the burns service provided by Hospital Universiti Kebangsaan Malaysia. However, Elbergn<sup>19</sup> reports from Denmark showed a downward trend with a better burns prevention programme. The programme includes a campaign in the media, revision of the laws and regulations, improvement in safety of household products directed towards prevention of burn injuries among smaller children<sup>17</sup>. Our study and reports by Ho<sup>14</sup> did not show any seasonal variation in burns admission.

The mortality rate remained the same over the 2 years study period, with the number of severe burns patients remaining small. Mortality rate reported by other investigators were 1.8%, 2%, 2.3%, 7.4% and 14.3% in Cronin<sup>20</sup>, Muguti<sup>10</sup>, Ho<sup>7</sup>, al-Shlash<sup>11</sup>, and Mahaluxmivala<sup>3</sup> respectively. Burns of more than 20% of TBSA associated with severe smoke inhalation were fatal in 50-80% of patients<sup>5</sup>. In our study mortality of inhalation injury was comparable to other studies. Our study showed similar results with that reported by Ho in which mortality of burns was related to large TBSA burns and inhalation injury<sup>7</sup>.

### Conclusion

This study showed that a majority of the children had scald burns at home. This calls for better safety measures and prevention of burns in children. The duration of hospital stay was significantly increased in patients with more than 20% TBSA burns. There was a higher mortality with larger area of burns and those associated with inhalation injury. A well-equipped Burns Unit is necessary to provide adequate care for this group of patients. This is increasingly more relevant with the rising number of admissions.

This study also found that most of the superficial burns could be treated successfully with collagen membrane dressing. At present the Intensive Burns Unit is being used for the treatment of superficial burns patients. Therefore, the development of a separate new burns ward that require fewer nursing staff with the use of collagen membrane may be more cost effective in the long term for treating superficial burns. However, this is only a preliminary study and further studies would provide a better understanding in improving the quality of care and the delivery of service to burns patients locally.

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