Epidemiological and bacteriological profile of burn patients at Nepal Medical College Teaching Hospital

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ABSTRACT

This study was conducted to know the epidemiological and bacteriological profile of burn patients at Nepal Medical College Teaching Hospital. The charts of 50 burn patients admitted in department of surgery were reviewed retrospectively. All the epidemiological characteristics, mode of injury, time taken to reach hospital and involved body surface areas were noted. The charts were also reviewed for bacterial isolates from burn wounds and its sensitivity pattern for various antibiotics. Data was analyzed using the statistical package for social sciences (SPSS) for Windows. The mean age of patients was 31.8 years with male: female ratio of 1.3:1. Half of the patients were from Kathmandu. Fifty two percent of patients directly came to our hospital while rests were referred from other hospitals. The average time taken to reach hospital was 11.3 hours. Those patients who were referred from outside the valley took longer time (p=0.002). Flame burn was the leading cause for injury (66.0%) followed by scald burn (16.0%), electric burn (14.0%) and acid burn (4.0%). Staphylococcus aureus (28.0%) was the commonest organism isolated from wound swab culture. Others were Klebsiella (16.0%), Pseudomonas (13.0%), Proteus (13.0%) and E.coli (13.0%). No growth was noted in 17.0% of patients. During the treatment, 14.0% of patients died and 4.0% left against medical advice. Remaining patients were discharged after complete recovery. Body surface area involvement was found to be a significant predictor of mortality (p<0.001) and the length of hospital stay was significantly low for them (p=0.05).

Keywords: Antibiotic sensitivity, burn, NMCTH, swab culture.

INTRODUCTION

Skin is one of the largest organs in the human body in terms of size and weight. The average adult skin surface area is 1.5 to 2.0 square meters. An intact human skin surface is vital to the preservation of body fluid homeostasis, thermoregulation, and the host's protection against infection. The skin also has immunological, neurosensory, and metabolic functions such as vitamin D metabolism.[1] Burn injury creates a breach in the surface of the skin and hampers those vital functions which are essential to sustain life.

The survival rates for burn patients have improved substantially in the past few decades due to advances in resuscitation, nutritional support, pulmonary care, wound care, and infection control practices in specialized burn units. Burns in Nepal cause an estimated 1700 deaths per year and much suffering. [2] It is the third most frequent cause of injury and death among all children from birth to age of 19 years.[3] In a report from Kathmandu, among school adolescent, burn used to be a significant (22.0%) cause of unintentional injuries.[4]

In the developing world like ours, a wide gap between the number of burn patients and available resources exists. There are very few functional specialized burn units in our country. So, even severe burn patients, who require specialized care, are forced to be managed in general wards in the hands of general surgeons who do not have specialized training in managing burn patients. As a result, we have not been able to lower the burn related deaths as compared to western world. So, this study was designed in view of assessing the epidemiological data, bacteriological profile and factors affecting mortality in patients hospitalized with burn injury at Nepal Medical College Teaching Hospital (NMCTH) which also caters many in the absence of specialized burn unit.

MATERIALS AND METHODS

This retrospective study was conducted in NMCTH, during a period of two years from January 2005 to January 2007. The charts of 50 consecutive patients who were admitted in department of surgery with burn during that period were reviewed. The patient's age, sex, address and mode of injury were noted. Similarly, time taken to reach the hospital, involved body surface area, referral place and length of hospital stay were noted in a pre-designed proforma. All the relevant investigations including swab culture were also noted. The charts were reviewed for bacterial isolates from the burn wounds

Table-1: Descriptive statistics

	Mean	SD	Range
Age (years)	31.8	21.9	1-81
Hospital arrival (hours)	11.3	16.3	0.25-96
Body surface area involved (%)	23.5	17.9	4-97
Duration of hospital stay (days)	15.9	17.1	1-64
Hemoglobin (gm%)	12.9	2.9	5.2-18.1
Total leucocytes count (X103/ml)	12.3	6.5	5-34.4
Neutrophils (%)	76.9	12.4	52-95
Lymphocytes (%)	21.5	11.8	3-48
Blood Urea (mg/dl)	32.1	26.5	12-124
Serum Creatinine	0.9	0.4	0.4-3.0

and its sensitivity pattern for various groups of antibiotics. The length of hospital stay was registered in days and included the day of admission and discharge or death.

Data from the proforma was entered and analyzed using the statistical package for social sciences (SPSS) for Windows. One-way ANOVA was used to compare means between two groups. The level of significance for all tests was set at P<0.05.

RESULTS

The mean age of patients in this study was 31.8 ± 21.9 years. There were 29 males (58.0%) and 21 females (42.0%) with male:female ratio of 1.3:1. (Fig.1) Maximum number of patients (28.0%) were in the age group of 20-30 years (Fig.2). Fifty percent of patients were from Kathmandu. Rests were from Sindhupalchok (12.0%), Bara (8.0%), Dolakha (6.0%), Makawanpur

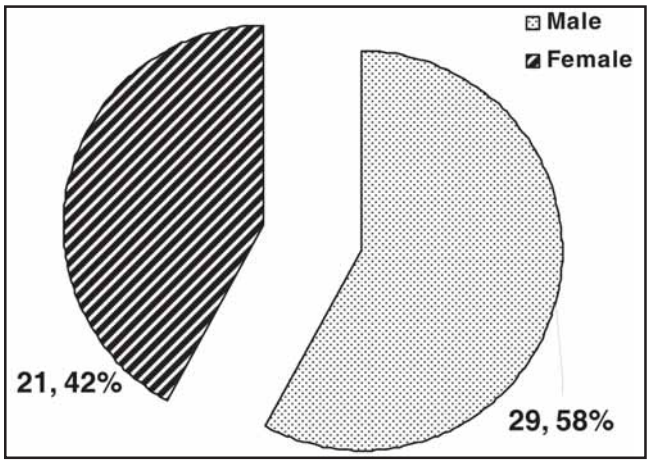

Fig.1. Sex distribution of burn patients

(6.0%), Ramechap (4.0%), Lalitpur (4.0%) and Nuwakot (2.0%) districts. Among those patients, 52.0% came directly to our hospital (group I) and 34.0% were referred from other hospitals inside valley (group II) due to unavailability of beds. Remaining 14.0% patients were referred from hospitals outside Kathmandu valley (group III) (Fig.3). The average time required to reach our hospital after the incident was 11.3 hours which ranges from 15 min to 96 hours. Group I patients required 5.2 hours only to reach our hospital while group II and group III required 13.6 and 28.4 hours respectively and this difference was statistically significant (p=0.002). Primary resuscitative measures were provided at the referring hospitals to those patients who were later referred to our hospital. Flame burn was the leading cause for injury (66.0%) followed by scald burn (16.0%) (Fig.4). Accidental explosion of gas (10.0%), kerosene stove, and cloth catching fire while working at kitchen were few causes for flame burn. Maximum number of patients with scald burn was children and they sustained injury after accidental fall over boiled water or soup.

Table-2: Comparison of means between the discharged and mortality groups

	DISCHARGE		**MORTALITY**		**p value**
	Mean (SD)	**Range**	**Mean (SD)**	**Range**	
Age (years)	29.6 (20.8)	1-81	45.3 (25.9)	10-79	0.08
Hospital arrival (hours)	11.3 (17.3)	0.25-96	11.3 (8.1)	0.5-24	0.99
Body surface area involved (%)	19.4 (12.3)	4-50	48.5 (26.9)	18-97	<0.001*
Duration of hospital stay (days)	17.8 (17.7)	1-64	4.5 (2.2)	1-8	0.05*
Hemoglobin (gm%)	13.1 (2.6)	7.5-18.1	11.7 (8.1)	5.2-16.7	0.33
Total leucocytes count (X103/ml)	11.7 (5.5)	5-26.5	15.5 (11.1)	8.1-34.4	0.23
Neutrophils (%)	77.1 (12)	52-94	76 (16)	61-95	0.85
Lymphocytes (%)	21.3 (11.3)	6-48	22.6 (15.7)	3-37	0.83
Blood Urea (mg/dl)	28.8 (26.1)	12-124	43.6 (27.4)	16-89	0.28
Serum Creatinine	0.9 (0.5)	0.4-3	0.8 (0.1)	0.6-1	0.63

* p Value <0.05 (Significant)

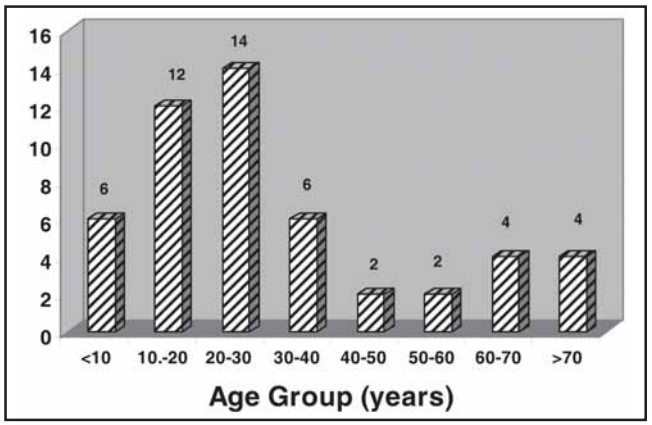

Fig.2. Age distribution of burn patients

Electric injury accounted for 14.0% and 4.0% had acid burn. All those patients with acid burn were from automobile battery workshop. Various hematological and biochemical parameters of the burn patients are listed in Table-1.

After third day of admission, wound swab was sent for culture and sensitivity from 24 patients. Staphylococcus aureus (28.0%) was the leading growth from the wound followed by Klebsiella sps (16.0%), Pseudomonas sps (13.0%), Proteus sps (13.0%) and E.coli (13.0%). No growth was noted in 17.0% of patients (Fig.5). Antibiotic sensitivity and resistance pattern of each isolates is listed in detail in Table-2. Eighty two percent of burn patients were discharged from ward after complete recovery, 4.0% left against medical advice while 14.0% of patients died during the course of treatment (Fig. 6). Various parameters were analyzed to identify factors responsible for mortality in burn patients (Table-2). Body surface area of burn was found to be a significant predictor of mortality among those patients ($p<0.001$). Although the mean age of the patients, who had died, appeared to be high (45.3 Vs 29.6 years), statistical significance did not exist between them ($p=0.08$).

DISCUSSION

Burn is one of the most common and devastating forms of trauma. Patients with Serious thermal injury require immediate specialized care in order to minimize morbidity and mortality. According to the data published by Rimdeika *et al*,[5] the mean age of patients treated for burns in the Kaunas University of Medicine Hospital was 41.3 ± 17.0 years. The mean age of our patients was less compared to that study which may be because of small sample size. Similar to our study, more than half the patients were males in a study conducted by Kristina *et al*.[6] Maximum number of patients were in 20 to 30 years age group. In a similar study from Nepal, the major bulk of patients were in 15 to 59 years age group.[2] Most of the patients were from the districts close to the valley. More than half of the patients came directly to our hospital without seeking any medical intervention from outside.

Most burns were preventable. Poverty is a major underlying cause, together with ignorance and a fatalistic attitude. Typically more than one factor was involved, including open fires, poor quality or homemade lamps and stoves, loose clothing which is non fire retarding and lack of fire extinguishing devices. Human factors included poor supervision of children, filling lamps and stoves while alight, lack of first aid knowledge and not seeking medical attention early after injury.

Patients who were near to our hospital came early for treatment while those patients who were far or being treated outside came little late and found that those patients who came early for treatment had a better outcome.

According to Liu *et al*[2], the vast majority of burns occurred at home. Flame burns were most common followed by scalds. We also found that Accidental explosion of gas, kerosene stove, and cloths catching fire while working at kitchen were few causes for flame burn. In another study conducted in Nepal, main cause of flame burn was household fire due to similar reasons as in our case.[2] A study from Karachi recommended better design of lamps and stoves, kerosene stoves with pressure gauges to reduce the incidence of explosions, sand buckets and first aid training.[9] Contrary to our report, various studies showed that main types of burns

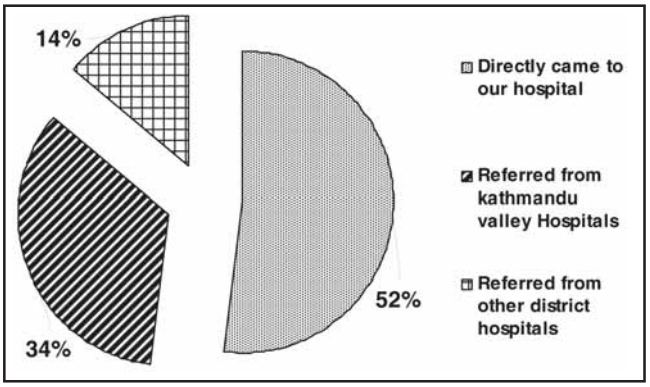

Fig.3. Referral of burn patients to NMCTH

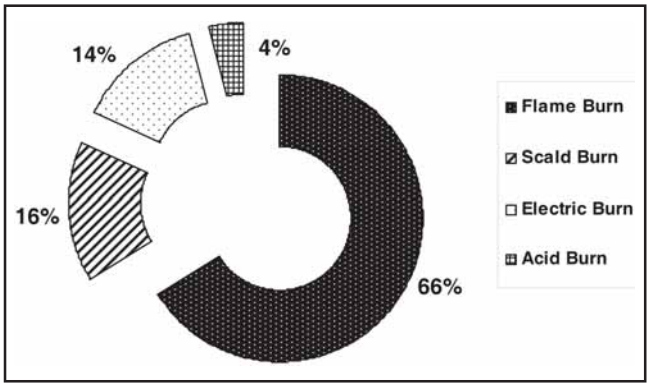

Fig.4. Causes of burn injury

Table-3: Bacteria isolated from burn wound swab culture and its sensitivity (S) and resistance (R) pattern with various antibiotics

S.No.	Growth	Ciprofloxacin	Ofloxacin	Azithromycin	Cloxacillin	Amikacin	Ceftriaxone	Gentamycin	Chloramphenicol	Ampicillin	Amoxicillin	Tetracycline	Tobramycin	Erythromycin	Nitrofurantoin	Nalidixic acid	Cotrimoxazole	Cephalexin	Ceftazidime
1	*Staphylococcus aureus*	S	S				S			R	R								S
2	*Staphylococcus aureus*		S		S		R				R								
3	*Staphylococcus aureus*	S	S	R		S		R		R	S		S	R	S				S
4	*Staphylococcus aureus*	S	S	S		S		S								S			S
5	*Staphylococcus aureus*	S	S		R	S								S	S			S	
6	*Staphylococcus aureus*	R				S	R	R	S	R	R	S	S				R	R	
7	*Staphylococcus aureus*	S			S	S		S	S	S			S	S				R	
8	*Klebsiella sps.*	S			S					R					S				
9	*Klebsiella sps.*	S	S			S		R					S						R
10	*Klebsiella sps.*					S									S		S		
11	*Klebsiella sps.*					S				R		S			S				
12	*Pseudomonas sps.*		S		R							R					R		
13	*Pseudomonas sps.*		S		R														
14	*Pseudomonas sps.*	S		S		S				R				R					
15	*Proteus sps.*	S	S		R	S											R		
16	*Proteus sps.*	S		S		S					R		S	R				R	
17	*Proteus sps.*	S	S		R			S		S	S	S			S		S		
18	*E.coli*	S	R	S	R		R								R				R
19	*E.coli*	S		S	R	R	R			R									
20	*E.coli*	S		S				R			R	R	S		R				R

in developed countries were scalds.[7,8] Scald burn were mainly seen in children and this fact was also supported by the study done at Western Regional Hospital of Nepal.[2] However even with better education, poverty remains. For many people in rural areas electricity and a gas supply are unavailable. Many families use kerosene lamps and cook on kerosene stoves or open wood fires as they cannot afford safer heating and lighting devices and stoves. Flame retardant clothes are an unrealistic option in a poor country like ours.

Open and large areas of burn injuries create favorable conditions for the penetration of hospital infection. For this reason, special attention to hospital infection should be paid in department of burns. According to the data provided in literature, the most common infection in burn patients is that with Staphylococcus aureus (30.0%) which is similar to our observation.[10] In case of a severe burn, the probability of methicillin resistant Staphylococcus aureus (MRSA) infection increases as the patients spend more time in the department and undergo more frequent dressings. Therefore, intervention should be performed as early as possible, thus decreasing the duration of hospital stay, infection-related treatment

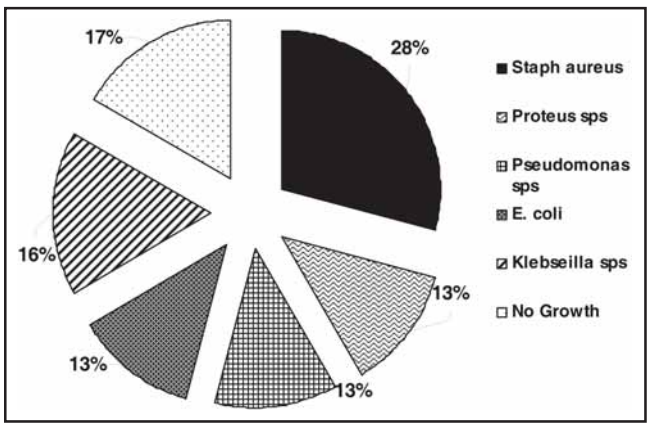

Fig.5. Bacteria isolated from burn wound swab culture

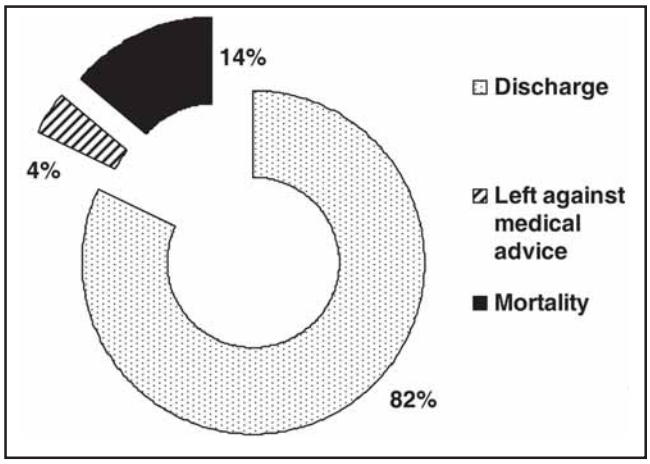

Fig.6. Outcome of burn patients at NMCTH

expenditures, and improving the quality of treatment. Staphylococcus aureus is a causative agent that is transmitted through physical contact, therefore special attention should be paid to asepsis and antisepsis. Patients with diagnosed MRSA infection should be isolated and dressed using disposable materials.[10]

Most of the patients in our study were discharged after complete recovery. Only 14.0% of patients died during the course of treatment. Those who died had body surface area involvement greater as compared to those patients who were discharged. This fact was also supported by another study in which none of the patients with body surface area burn more than 40.0% survived.[2] Surprisingly, we were able to save one patient with burn involving 50.0% body surface area even in the absence of specialized unit. The mean age of patient who died seemed to be high as compare to those who were discharged, significance of this could not be proven statistically.

In conclusion, burn injuries are very common throughout the world and especially so in the underdeveloped country like ours where people have to depend on traditional way of cooking and handling fire. Burns cause great suffering to individual patients and are a great cost to one of the poorest countries in the world. NMCTH is also catering many suffers even in the absence of specialized burn units.

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