

Predictors of Length of Hospital Stay among Burns Patients in Mulago National Referral Hospital, Kampala- Uganda

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Abstract

Background: According to WHO (2014), burn injuries are a major problem to health care worldwide. Ninety five per cent of all burn cases occur in LMICs leading to prolonged and expensive hospital stays (WHO, 2009). In Uganda, burn injuries account for 11% of all childhood injuries (Nakitto & Lett, 2010). Burns Unit at Mulago National Referral Hospital is the only specialized burns care unit in the country. However, it was observed that patients in this unit spends unusually longer time in admission than the WHO (2015) recommended time. Thus the objective of this study was to determine the predictors of length of hospital stay among burn patients in Mulago National Referral Hospital Kampala, Burns Care Unit from July, 2014 to June, 2015. **Methods:** A retrospective study design was used by reviewing medical records of patients discharged from the Burns Care Unit from July, 2014 to June, 2015. **Results:** More than half (57.1%) of the patients in the study were male with children 5 years and below constituting 55.2%. The majority of patients (86.2%) got burnt at home. The average length of stay for patients was 24.3 days (± 22.1 days). The degree/ depth of burns (OR=44.22, 95% CI =10.86-180.08, P=0.000) was the single most significant predictor of length of stay of patients with burns at multivariate analysis level.

Keywords: Burns, length of stay, predictors

Introduction

According to Wounds International (2014), burn injuries are a major problem to health care and present a range of challenges to healthcare professionals who encounter them worldwide. In addition, the average lengths of hospital stay for burns have been found to be nearly twice as long and costly in comparison to the other hospital admissions (Milenkovic, Russo & Elixhauser, 2007). According to WHO (2014) fact sheet on burns, the rate of child deaths from burns is over 7 times higher LMICs than in HICs. In addition, non-fatal burns are a leading cause of morbidity with prolonged hospitalization, disfigurement and disability which often result into stigma and rejection of the victims (WHO, 2014). Globally, 300,000 people die from burns and millions more are disabled annually (WHO, 2009). Additionally, 95% of all burns cases occur in LMICs (WHO, 2009) and about half of these cases occur in the South-East Asian Region (WHO, 2014). Furthermore, in low- and middle-income countries burns are among the leading causes of disability-adjusted life-years (DALYs) lost (WHO, 2014).

In Uganda, burn injuries account for 11% of all childhood injuries (Nakitto & Lett, 2010). Additionally, burns contributed 45% of traumatic emergencies in Kampala in 2009 Jayaraman *et al.*, (2009), 6% of casualty cases and 15% mortality at Mulago Hospital in 2004 (Zheng & Enock, 2011). Mulago hospital is the only hospital in Uganda with specialised burns' care unit. Personal observation show that burns patients in the specialised Burns Unit at Mulago national referral hospital spend longer than usual time in admission in comparison to the WHO (2007) recommended average length of stay for patients with burns.

Burns consist of tissue damage resulting from scalds, fires, and flammable liquids, or other causes such as sunlight, chemicals, and nuclear radiation (WHO, 2014). In the past 10 years, medical advances have contributed to improvements in skin grafting, wound cleaning and infection prevention which should lead to a reduction in the length of hospital stay for burn patients (Milenkovic, Russo & Elixhauser, 2007). According to WHO, superficial burns should take about 7days and partial thickness burns should take about 10-21 days to heal (WHO, 2015). This means the patients with such degree of burns should take less than 21 days on admission. However, it has been observed that burns patients in Mulago Hospital Burns Care Unit take longer than the above recommended time on admission. Long length of hospital stay is associated with higher economic cost to patients and their families, hospitals and country (Milenkovic, Russo & Elixhauser, 2007).

Methods and Materials

Settings

The study reviewed medical records of patients admitted to Mulago National Referral Hospital Burns Care Unit, Kampala- Uganda from July, 2014 to June, 2015.

Design and sampling procedures

This was a retrospective analytical study which focused on patients treated and discharged from Mulago Hospital

Burns Unit from July, 2014 to June, 2015.

Data collection and management

Data was extracted from patients' medical records using a data extraction form designed by the government of Uganda. Records were considered if the patients had total burn surface area (TBSA) 10 per cent (WHO, 2007).

Outcomes and exposure variables

The main outcome measure was length of hospital stay. The independent variables comprised of patient's socio-demographic characteristics such as age, sex, place of residence of the patient at the time of sustaining burn injury, place where the injury occurred and relationship of burn patient to caretaker as well as severity of burns including cause of burn, TBSA and degree of burns; surgical procedures performed on burn patients admitted at the unit including skin grafting, debridement and the pre-morbid condition of the patient and the in-hospital complications (co-morbidities).

Sample size estimation

A census of all the patients who were admitted and treated at the Burns Care Unit, Mulago National Referral Hospital-Kampala from July, 2014 to June, 2015 was taken from the patients' register. This yielded a total 261 patients who were selected

Ethical considerations

The study was approved by Mulago Hospital Research and Ethics Committee (MREC) and the International Health Sciences University research ethics committee.

Results

The data revealed that the average length of hospital stay (ALOS) was 24.3 days (± 22.1 days) with the minimum and the maximum number of days spent on admission by the burns patients during the study period being 2 and 131 days respectively. Inspection of Q-Q plots revealed that TBSA was normally distributed for both groups of LOS (that is those who spent 21 days or less and those who spent more than 21 days) and that there was homogeneity of variance as assessed by Levene's test for Equality of Variances. Therefore, an independent t-test was run on the length of hospital stays for the burns patients as well as 95% confidence intervals (CI) for the mean difference in TBSA between patients who spent 21 days or less and those who spent more than 21 days (Table 5 above). Results presented in Table 5 shows that there was a significant difference in the mean TBSA of patients who spent 21 days or less in admission and those who spent more than 21 days. Specifically, the finding showed that the mean TBSA in the group that stayed in hospital for more than 21 days (18.96%) were significantly higher than for the group that stayed at the hospital for 21 days or less (16.78%) ($t = 2.161$, $p = 0.032$ with a mean difference of -2.18 (95% CI: -4.168 -0.190) TBSA. This finding shows that patients with larger TBSA are more likely to stay in admission for more than 21 days compared with those who have smaller TBSA.

Table 13 Total body surface areas burnt and length of hospital stay

Variable (N=261)	Length of stay			t-test for Equality of Means					
	N	Mean	SD	t	df	P-Value	Mean difference	95% CI of the mean difference	
								Lower	Upper
TBSA	21 days	156	16.78	6.95					
	21 days	105	18.96	8.62	2.16	190.5	0.032	-2.179	-4.168 -0.19

Source: Secondary data

****Statistically significant variables ($p < 0.05$)**

This was higher than the average stay of 21 days for partial thickness burns recommended by the WHO (WHO, 2015). The average total body surface areas burnt was 17.7% ($\pm 7.7\%$) and the minimum and maximum TBSA of patients included in this study were 10% and 60% respectively. The results presented in table 1 below show that cause of burns ($X^2 = 33.51$, $P < 0.001$) and degree of burns ($X^2 = 143$, $P < 0.001$) have a significant association with length of hospital stay of burn patients. In other words, the cause of burns and the degree of burns determines how long a patient stays in admission.

Table 2 Characteristics of burns injuries and length of hospital stay

Predictor variables (n=261)	Length of stay		Statistic	P-value
	21 days	21 days		
Cause of burns (n=261)				
Hot liquids (Scalds)	131 (84.0%)	57 (54.3%)	33.508	0.000
Direct fire (Flame)	15 (9.6%)	38 (36.2%)		
Corrosive chemicals (acid)	1 (.6%)	4 (3.8%)		
Electricity	8 (5.1%)	6 (5.7%)		
Contact with hot object	1 (.6%)	0 (0.0%)		
Total	156	105		
Degree of burns(n=261)				
Full thickness burns	0 (0.0%)	24 (22.9%)	143.768	0.000
Deep partial thickness burns	5 (3.2%)	53 (50.5%)		
Superficial burns	151 (96.8%)	28 (26.7%)		
Total	156	105		

Source: Secondary data

****Statistically significant variables (p<0.05)**

The study results presented in Table 1 show that only age ($X^2 = 15.934$, $p=0.001$), district of residence ($X^2=12.272$, $P=0.031$) and relationship of attendants ($X^2 = 21.628$, $p=0.003$) to the patients were found to have a significant association with length of hospital stays. This means that the age of a patient with burns, where she or he lives and the relation between the patient and his/ her attendant directly influence the number of days that patient spends in admission. Further, majority (76%) of patients who were being cared by their siblings spent more than 21 days in admission as opposed to those who were cared by their mothers (31.3%).

Table 3: Patients' characteristics and length of hospital stays

Patients' characteristics	Length of hospital stays			Statistic			
	21 days	21 days	Total	X^2	P-Value		
Sex (n=261)							
Female	62 (39.7%)	50 (47.6%)	112 (42.9%)	1.589	0.207		
Male	94(60.3%)	55(52.4%)	149 (57.1%)				
Total	156	105	261				
Age groups** (years) (n=261)							
0-5 years	101 (64.7%)	43 (41.0%)	144 (55.2%)	15.934	0.001		
6-11	10 (6.4%)	8 (7.6%)	18 (6.9%)				
12-17	9 (5.8%)	7 (6.7%)	16 (6.1%)				
18years & above	36 (23.1%)	47(44.8%)	83 (31.8%)				
Total	156	105	261				
Districts of residence** (n=261)							
Kampala	103 (66.0%)	49 (46.7%)	152 (58.2%)	12.272	0.031		
Luwero	3 (1.9%)	5 (4.8%)	8 (3.1%)				
Mityana	3 (1.9%)	3 (2.9%)	6 (2.3%)				
Mukono	4 (2.6%)	7 (6.7%)	11 (4.2%)				
Wakiso	33 (21.2%)	27 (25.7%)	60 (23.0%)				
Others	10 (6.4%)	14 (13.3%)	24 (9.2%)				
Total	156	105	261				
Where did the patient get burnt? (n=261)							
Home	137 (87.8%)	88 (83.8%)	225 (86.2%)	9.883	0.195		
Market	2 (1.3%)	0(0.0%)	2 (.8%)				
Neighbour's home	4 (2.6%)	1 (1.0%)	5 (1.9%)				
On the way home	1 (.6%)	1(1.0%)	2(0.8%)				
School	2 (1.3%)	0 (0.0%)	2 (0.8%)				
Workplace	10 (6.4%)	15 (14.3%)	25 (9.6%)				
Total	156	105	261				
Did the patient have an attendant in hospital? (n=261)							
No	6 (3.8%)	6 (5.7%)	12 (4.6%)	0.499	0.480		
Yes	150 (96.2%)	99 (94.3%)	249 (95.4%)				
Total	156	105	261				
Relationship of attendants to the patients (n=249)**							
Child/ children	2 (1.3%)	4 (3.8%)	6 (2.3%)	21.628	0.003		
Father	24 (15.4%)	18 (17.1%)	42 (16.1%)				
Mother	90 (57.7%)	41 (39.0%)	131 (50.2%)				
Siblings	6 (3.8%)	19(18.1%)	25(9.6%)				
Spouse	6(3.8%)	6(5.7%)	12(4.6%)				
Other relatives+	11 (7.1%)	4 (3.8%)	15 (5.7%)				
Non-relatives**	11 (7.1%)	7 (6.7%)	18 (6.9%)				
Total	144	99	249				

Source: Secondary data

****Statistically significant variables (p<0.05)**

The study findings revealed that having complications while on admission was significantly associated with length of stay of burns patients ($X^2 = 37.474$, $P < 0.001$). Additionally, the odds of patients with no complications spending more than 21 days in admission was only 0.345 times that of those who got complications in the wards (OR= 0.345, 95% CI, 0.289, 0.411). This means only 1 in 4 or 25% of patients with no complications spent more than 21 days on admission. In contrast all patients with complications (100%) spent more than 21 days on admission. Further, anaemia (21.7%) and severe acute malnutrition (21.7%) were the most common complications got by the patients within the study period. More importantly, all patients (100%) with the different specific complications spent more than 21 days in admission and this finding was statistically significant ($P=0.000$).

Table 4 Co-morbidities and length of hospital stays among burn patients

Did patient have any Chronic disease?	Length of hospital stays		X^2	P-Value	OR	95% CI	
	21 days	21 days				Lower	Upper
No	149(95.5%)	94 (89.5%)	3.51	0.06	1.0	0.933	6.651
Yes	7 (4.5%)	11 (10.5%)					
Total	156 (100%)	105 (100%)					

If yes, name specific chronic disease that the patient had (n=18)

Alcoholism	1 (14.3%)	0 (0.0%)	0.094*
Diabetes	0 (0.0%)	1 (9.1%)	
Epilepsy	2 (28.6%)	8 (72.7%)	
HIV	1 (14.3%)	1 (9.1%)	
Mental illness	2 (28.6%)	1 (9.1%)	
Physical disability	1 (14.3%)	0 (0.0%)	
Total	07 (100%)	11 (100%)	

Did patient have any complication? (n=261)**

No	156 (100.0%)	82 (78.1%)	37.47	0.00	0.35	0.289	0.411
Yes	0 (0.0%)	23(21.9%)			1.0		
Total	156 (100%)	105(100)					

Specify complication that the patient had (n=23)*

Anaemia	0(0.0%)	5 (21.7%)	5 (21.7%)	0.000
Gangrene	0 (0.0%)	1 (4.3%)	1 (4.3%)	
Pneumonia	0 (0.0%)	4 (17.4)	4 (17.4)	
Pseudomonas	0 (0.0%)	2 (8.7%)	2(8.7%)	
SAM	0 (0.0%)	4 (17.4%)	4(17.4%)	
Sepsis	0 (0.0%)	5 (21.7%)	5 (21.7%)	
UTI	0 (0.0%)	2 (8.7%)	2 (8.7%)	
Total	0(00%)	23 (100%)	23 (100%)	

Source: Secondary data

**Statistically significant variables ($p < 0.05$)

Furthermore the study findings shows that surgical procedures had a significant statistical relationship with length of hospital stay for burn patients discharged from Mulago Hospital Burns Unit during the study period ($X^2=136.2$, $P < 0.001$).

Table 5Medico- surgical procedures and length of hospital stay

What medico-surgical procedures were done on the patient? (n=261)	Length of stay		Statistic	
	21 days	21 days	X ²	P-value
No surgery	150 (96.2%)	32 (30.5%)	136.2	0.000
Debridement	3 (1.9%)	1 (1.0%)		
Surgical skin grafting	3 (1.9%)	72 (68.6%)		
Total	156 (100%)	105 (100%)		

Multivariate analysis of predictors of length of hospital stays among burns patients using binary logistic regression

The multivariate analysis using logistic regression showed that degree of burns (OR=44.22, 95% CI: 0.86-180.08, P=0.000) was the single most important predictor of length of stay of patients with burns discharged from Mulago Hospital Burns Unit from July, 2014 to June, 2015. It was also confirmed that the odds of a person with full thickness burn spending more than 21 days in admission was 44.22 times more than a person with superficial burns. Age, TBSA, medico- surgical procedures, relationship of attendants to patients and district of residence did not have significant relation with length of hospital stay at the multivariate analysis even though they were all significant at bivariate analysis level.

Table 6 Multivariate analysis of predictors of length of stay among burn patients

Variable	Odds Ratio (OR)	95% C.I. for OR		P-value
		Lower	Upper	
Age of patients (n=261)	1.044	0.931	1.17	0.459
District of residence (n=261)				
Kampala	1.598	0.361	7.069	0.537
Luwero	17.949	0.823	391.461	0.066
Mityana	0.037	0.001	1.051	0.054
Mukono	2.499	0.062	100.891	0.627
Others	0.738	0.064	8.537	0.808
Wakiso	1.0			
Relationship of attendant to patients (n=249)				
Children	7.193	0.023	2227.779	0.5
Father	1.789	0.017	184.1	0.806
Mother	3.063	0.039	242.5	0.616
No relation	1.098	0.013	89.294	0.967
Siblings	32.218	0.567	1829.579	0.092
Spouse	1.0			
Degree of burns (depth of burns) (n=261)**				
Superficial	1.0			
Full thickness	44.222	10.860	180.076	0.000
Total Body Surface Areas burnt (TBSA) (n=261)	1.032	0.95	1.12	0.457
Medico-surgical procedures				
No surgery	1.0			
Debridement	0.022	0.005	0.096	0.000
Surgical skin grafting	0.173	0.009	3.509	0.253

Source: Secondary data

**Statistically significant variable

Discussion

The mean length of hospital stay (ALOS) in this study was 24.3 days. This is not only higher than the 7 days recommended by WHO (2015) for superficial burns but also higher than the recommended 10- 21 days for deep

partial thickness burns. Findings from this study is more than twice the value got from a study carried out in Iran which found that the average length of stay among children with mean age of 5.65 years was 7.5 days (Rezaei, Matin & Karyani, 2015). This difference could be explained by the differences in study population. Whereas the average age in this study was 12.8 years, the average age of patients in the study in Iran was only 7.5 years. Additionally, another study carried out in the U.S found that the average length of stay for patients with burns was only 8.9 days (Milenkovic, Russo & Elixhauser, 2007). This is almost 3 times lower than the figure got in this study. This could be attributed to the differences in the nature of burns, levels of care and socio-economic factors between the two patients' populations. For instance in the Mulago Hospital Burns Unit, sometimes patients are required to buy certain drugs or even sundries for wound dressing in case the unit has got stock outs and they cannot afford to buy such medicines (personal observations).

Socio-demographic factors associated with length of stay

This study found out that most patients (57.1 percent) with burns within the study period (July, 2014 to June, 2015) were male patients. This was similar to the finding of a study carried out in the USA, where about 70% of the burn patients were men (ABA, 2012). In contrast, another study done in USA between 2000 and 2004, found that males made up less than half (45.8%) of burns patients although they had a higher length of stay compared to women (Milenkovic, Russo & Elixhauser, 2007).

Similarly, finding of this study conforms to that of another study carried out in the USA which established that burns were more likely to occur among males compared to females (Milenkovic, Russo & Elixhauser, 2007). Children who were 5 years and below constituted the highest proportion (55.2%) of all patients treated and discharged from Mulago Hospital Burns Unit between July, 2014 and June, 2015. Additionally, children under 5 years are at explorative stage of their lives and are very active (Milenkovic, Russo & Elixhauser, 2007). This coupled with the open fire practices make this age group more susceptible to burns than other age groups.

Regarding age of the patients, the mean age of patients in this study was 12.8 years and this was not surprising given that children 5 years constituted more than half (55.2%) of all the patients discharged from the Burns Unit. This finding is similar to findings got from a review of 54 publications from 14 countries in sub-Saharan Africa with 32,862 burns patients which found that the average age of patients with burns was 15.3 years with children aged 10 years and below making over 80% of the burn patient population (Nthumba, 2015).

Patients' characteristics and length of hospital stays

This study found personal factors of age ($X^2 = 15.934$, $p=0.001$), district of residence ($X^2 = 12.272$ $p=0.031$) and relationship of attendants ($X^2 = 21.628$, $p=0.003$) to the patients having a significant relationship with length of hospital stays. This finding is supported by a study in USA which found out that admissions for burns were more likely to occur in younger patients (Milenkovic, Russo & Elixhauser, 2007) meaning being young significantly increases the risk of morbidity from burns.

Burn injuries characteristics and length of hospital stay

This study found out that the commonest cause of burns was scalds with 72 per cent of all cases being caused by hot liquids including hot water, soup, tea and milk among others with flames causing only 20.3 percent. This finding is similar to that found by a systematic review of 54 publications in 14 sub-Saharan African countries which found that the commonest cause of thermal injuries was scald which accounted for 59 percent of all burns with flame burns accounting for 33 percent of the total cases of burns in those countries (Nthumba, 2015).

In addition, this study found that cause of burns ($X^2(4) = 33.51$, $P<0.001$), degree of burns ($X^2 = 143$, $P<0.001$) and TBSA all have a significant relationship with length of hospital stay of burns patients at bivariate analysis. This finding is similar to that of a retrospective study in an Iranian hospital which found that cause of burns significantly influenced length of hospital stay (Rezaei, Matin & Karyani, 2015). Further, another study among advanced elderly burns patients aged over 80 years found that TBSA was the strongest predictor of length of stay (Pomahac *et al.*, 2006).

Contrary to this finding, a study in Iran found no significant relationship between degree of burns and length of stay (Rezaei, Matin & Karyani, 2015). Yet in this study the degree of burns (OR=44.22, 95% CI:10.86-180.08, $P=0.000$) was found to be the single most significant predictor of length of hospital stay of patients with burns discharged from Mulago Hospital Burns Unit from July, 2014 to June, 2015.

Further, the results showed that there was a significant difference in the mean TBSA of patients who spent 21 days or less in admission and those who spent more than 21 days with those who spent more than 21 days in admission having a larger mean value of TBSA than those who spent less than 21 days. This therefore means that larger TBSA leads to prolonged hospitalization. This finding is supported by a retrospective cohort study carried out at Imam Khomeini Hospital in Iran between 1993 and 2007 which found that burn size (TBSA) significantly influenced length of hospital stays among patients admitted with burns within the study period

(Rezaei, Matin & Karyani, 2015).

Co-morbidities and length of hospital stay among burns patients

This study found that getting complications while on admission was significantly associated with length of stay of burns patients. Additionally, the odds of patients with no complications spending more than 21 days in admission was only 0.345 times that of those who got complications in the wards (OR= 0.345, 95% CI: 0.289, 0.411). This means that only 1 in 4 or 25 per cent of patients with no complications spent more than 21 days on admission. In contrast, all patients with complications (100%) spent more than 21 days on admission. Additionally, the study found no statistical relationship between a patient with burns having a chronic disease (like epilepsy, HIV etc.) and length of hospital stay. This finding was rather surprising given that WHO (2007) list chronic diseases as one of the factors that prolong hospitalization for the burns patients.

Medico-surgical procedures and length of hospital stay

This study found that skin grafting was the commonest surgical procedures performed on burns patients at Mulago Hospital Burns Unit with 28.7 per cent of patients in this study being treated by skin grafting. This finding is similar to that of an earlier study carried out in Uganda among patients with burns which found that skin grafting was the commonest procedure carried out on the patients with 35.3 percent and 29.4 percent of burn patients who were HIV negative and HIV positive respectively receiving the procedure (Chalya *et al.*, 2011a). Furthermore, this study found that surgical procedures had a significant statistical relationship with length of hospital stay for burn patients ($X^2=136.2$, $P<0.001$) at the bivariate analysis level although this relationship was not significant at the multivariate analysis level. This finding is supported by available research evidences which show that early excision and skin grafting shorten length of hospital stay and improve functional outcome when used in the management of deep burns (Chalya *et al.*, 2011b).

Conclusions

- (i) Length of hospital stay among burns patients; Patients discharged from Mulago Hospital Burns Unit stayed in the ward longer than the WHO (2009) recommended period.
 - (ii) Patients' characteristics and length of hospital stay; Burns affected children 5 years and below more than any other age group. Age of an individual determines how long he stays on the ward basing on bivariate analysis. Basing on the finding of this study, homes were the most risky places for people to get burnt.
 - (iii) Burns injury characteristics and length of hospital stay; Hot liquids were the most common cause of burns among patients treated at Burns Unit within the study period. The cause of burns and the TBSA determines how long a person stays on admission with those having higher TBSA staying longer in the hospital. Depth of burns influences length of stay with patients with full thickness burns more likely to spend longer time on admission.
 - (iv) Co-morbidities and length of hospital stay; In-hospital complications prolongs length of hospital stay of burns patients
 - (v) Medico-surgical procedures and length of hospital stay; Surgical procedures such as skin grafting and debridement influence length of hospital stay basing on bivariate analysis.
 - (vi) Overall conclusion on predictors of length of hospital stays among burns patients
- Basing on the multivariate regression analysis, degree of burns was found to be the most significant and the only independent predictor of length of hospital stay among patients with burns who were treated and discharged from Mulago Hospital over a 1 year period (from July, 2014 to June, 2015).

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