Mortality from Thermal Burns in Patients Using EMS in India

Jennifer A. Newberry, MD, JD[1], Corey Bills, MD[2], Elizabeth Pirrotta, MS[1], Sybil Zachariah, MD[1], GV Ramana Rao, MD[3], SV Mahadevan, MD[1], Matthew C. Strehlow, MD[1]

1. Department of Emergency Medicine, Stanford School of Medicine, Stanford, CA, USA
2. Department of Emergency Medicine, UCSF, San Francisco, CA, USA
3. GVK Emergency Management and Research Institute (GVK EMRI), Telangana, India

Introduction

Globally, there were over 33.5 million thermal burn injuries in 2013, resulting in approximately 237,500 deaths. The majority of burn deaths, an estimated 90%, occur in low- and middle-income countries (LMICs).

In India, where an estimated 163,000 deaths occur annually due to fire-related injuries, small studies suggest that the patterns of burn injuries are different. Patients suffering burns are predominantly female, the average total body surface area (TBSA) burned is very high (65% versus < 10%), and self-inflicted burns are not uncommon. In fact, compared to other LMICs, India suffers the highest number of self-inflicted burns.

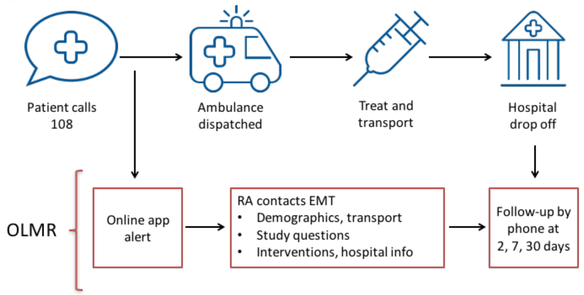
Emergency medical services (EMS) may be a key component in the public health infrastructure to improve outcomes from burns by decreasing time to care and increasing access to higher levels of care. GVK Emergency Management and Research Institute (GVK EMRI) is a public-private partnership that provides free prehospital emergency medical stabilization and transport. In 15 states in India, anyone can access GVK EMRI services via the toll-free phone number '108' seven days a week 24 hours a day.

However, there is no research examining the role of EMS in the care of patients with burns. In this study, we sought to characterize the demographics, management, and outcomes of patients using EMS for thermal burns across five states in India.

Methods

We enrolled a convenience sample of patients calling '108' for a chief complaint of 'burns' during daytime hours, six days a week. We collected data from May-August 2015 from Andhra Pradesh, Assam, Gujarat, Karnataka, and Telangana.

Exclusion criteria: chemical or electrical burns, interfacility transfers, patients who were absent, patients who refused transport.



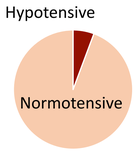
Results

Enrolled ***439 patients***
(9.1% of all calls)

48 hour response rate: 88.4%
7 day response rate: 87.2%
30 day response rate: 85.9%

Median time from dispatch to hospital:
56 minutes (IQR 35-82 min)

Inhalation injury
- 70% with inhalation injury
- Of these patients 83% received oxygen



Hypotension
- Only 66% of patients had a measured BP
- Most common reason for missing: burns to bilateral arms (81%)
- 6% of patients were hypotensive
- Half of hypotensive patients received fluids

DEMOGRAPHICS

Characteristic	N	%
All	439	100.0%
Age (years)		
< 18	59	13.4%
18-24	81	18.5%
25-34	119	27.1%
35-44	84	19.1%
45-54	55	12.5%
54-64	16	3.6%
≥ 65	25	5.7%
Gender		
Female	288	65.6%
Male	151	34.4%
Marital status		
Married	327	74.5%
Unmarried	67	15.3%
Economic status		
Below poverty level	221	50.3%
Above poverty level	210	47.9%
Incident location		
Urban	120	27.3%
Rural	280	63.8%
Tribal	38	8.7%

*Percents may not add up to 100% due to missing data

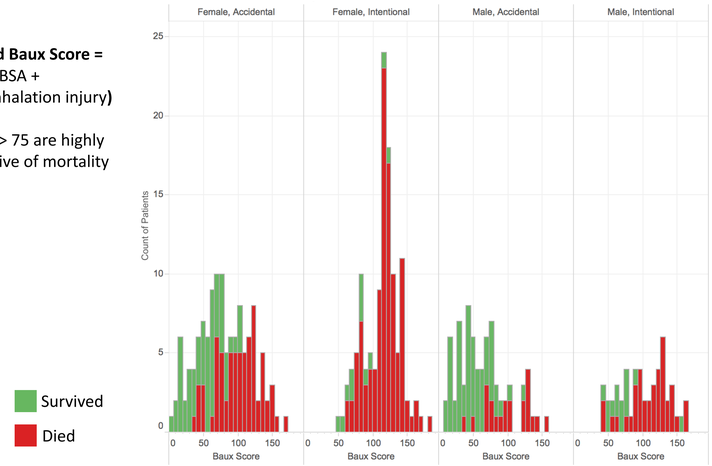
Median TBSA: 60% (IQR 30-90%)
Intentionally inflicted burns: 47%

30 day mortality: 64.5%
Almost half of all deaths occurred on the first day

Predicted Mortality (by Revised Baux Score) versus Observed Mortality, by Gender and Intentionality

Revised Baux Score =
age + TBSA +
(17 if inhalation injury)

Scores > 75 are highly predictive of mortality



MULTIVARIATE REGRESSION ANALYSIS OF MORTALITY

Variable	Unadjusted Odds Ratio (95% CI)	Adjusted Odds Ratio (95% CI)
Social status	0.62 (0.39, 0.99)	0.6 (0.31, 1.18)
Rural	0.99 (0.60, 1.61)	1.0 (0.47, 1.95)
Time to hospital	1.00 (0.99, 1.01)	1.0 (1.0,1.01)
Age	1.02 (1.00, 1.04)	1.0 (1.0, 1.03)
Tertiary hospital care	1.61 (0.98, 2.66)	1.1 (0.54, 2.43)
Gender*	2.90 (1.85, 4.52)	2.3 (1.25, 4.04)
Economic status*	1.37 (0.86, 2.02)	2.6 (1.16, 5.99)
Intentionally inflicted burn*	8.52 (5.14, 14.11)	6.6 (3.57, 12.19)
Inhalation injury*	6.04 (3.69, 9.88)	6.7 (3.1, 14.52)

* p-value < 0.05

Conclusions

EMS in India cares for a critically ill population. This population, while predominantly rural and tribal, comes almost equally from above and below the poverty line. EMS transports these patients in a timely manner – the vast majority of patients (88%) reach a hospital within 3 hours of their original injury.

Nonetheless, our data supports that the key intervention must be in primary prevention. The highest mortality in our study was seen in patients with intentionally inflicted burns. Most of these burns were self-inflicted using kerosene per patient/family/bystander report. These burns had the highest TBSA and highest rates of inhalation injury. Consequently, as the revised Baux score demonstrates, most of these burns had low predicted survivability, regardless of the care EMS could provide or connect them to.

Future research and interventions must focus on the role of gender-based violence, particularly dowry-related harassment, and mental health support for women in intentionally inflicted burns.

Acknowledgements

We would like to thank our amazing team of research assistants in India. Without their hard work and dedication, none of this would be possible. We would also like to thank Sybil Zachariah for presenting this study on our team's behalf.