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Original Research Article

Forty-eight-hour mortality in the emergency department: a record-based analysis of patterns and causes from a South Indian tertiary care centre

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ABSTRACT

Background: Early mortality within 48 hours of emergency department (ED) admission is a key indicator of acute care quality. Limited Indian data exist on its epidemiology, especially regarding contributory factors in both medico-legal (MLC) and non-medico-legal (non-MLC) deaths. To determine the 48-hour mortality rate in the ED, describe demographic and clinical profiles, identify the duration of ED stay prior to death, and evaluate causes and contributing factors to early mortality.
Methods: This retrospective record-based study was conducted at a tertiary care center in South India over two years (January 2019–January 2021). All 132 patients who died within 48 hours of ED admission were included. Demographic and clinical parameters, cause of death, referral-to-death interval, and contributory factors (organizational, disease-related, human error) were analyzed descriptively and comparatively across MLC and non-MLC cases.
Results: Out of 96,560 emergency department visits, 132 patients died within 48 hours of ED arrival, corresponding to a mortality rate of 1.37 per 1,000 ED visits. Most patients (58%) died within 6 hours of admission. Cardiac causes (51.5%) and sepsis (26.8%) were predominant in non-MLC deaths, while trauma (60%) was the leading cause in MLC. Over 60% of patients died within 1–6 hours of referral from other centers. Disease-related causes accounted for 65.7% of MLC and 41.2% of non-MLC deaths, followed by organizational delays and human errors.
Conclusion: Early ED mortality is driven by both clinical severity and systemic delays. Stratified analysis of MLC and non-MLC cases reveals opportunities to strengthen prehospital referral systems, triage protocols, and resource allocation in emergency care.

Keywords: Emergency department mortality, 48-hour mortality, Medico-legal cases, Prehospital referral, Resuscitation failure

INTRODUCTION

EDs are vital points of care that manage critically ill patients requiring rapid triage, diagnosis, and intervention. Despite advancements in emergency medicine, early in-hospital mortality particularly within the first 48 hours of admission remains a critical concern, often reflecting not only the severity of illness but also systemic gaps in care delivery. Studies from around the different regions of the world have shown that a significant proportion of deaths

occur within 48 hours of ED admission, especially among older adults with complex medical conditions.[1] Such early mortality metrics are increasingly being used as indicators of ED performance, patient safety, and care quality.

In India, emergency departments face unique systemic challenges such as overwhelming patient volumes, limited critical care beds, fragmented referral pathways, and inconsistent triage protocols. A retrospective audit at a large South Indian tertiary hospital found an overall ED mortality of 2.43% notably higher than in neighbouring countries with cardiac and sepsis-related deaths predominating, and around 24% deemed preventable due to management delays or protocol deviations.[2]

Another study in North India documented a 1.8% mortality rate among geriatric emergency patients compared to just 0.4% in younger cohorts, with age-related risk and delayed recognition identified as major contributors. These findings confirm the urgent need to focus not only on mortality, but on demographic vulnerability and care quality during critical early hours.[3]

While Indian ED mortality rates up to 2–3% are known, there is a distinct lack of time-specific analyses especially within the 48-hour window detailing demographic distributions, time-to-death intervals, and causative factors. Available studies often amalgamate all ED deaths, obscuring those that occur shortly after admission and potentially overestimating system performance. Moreover, the preventability audit from South India points to avoidable system failures yet national-level, time-constrained mortality data is still missing.[4] This gap inhibits targeted interventions, such as refined triage, protocol adherence, and staffing adjustments during the most vulnerable early ED hours.

To address this gap, the present study aims to determine the 48-hour mortality rate among patients presenting to the emergency department of a tertiary care center in South India. It further aims to describe the demographic patterns of these deaths, the time patients spent in the ED before death, and the immediate clinical causes contributing to mortality. By systematically analysing these parameters, this study hopes to generate actionable insights that can inform improvements in emergency care delivery and reduce preventable early deaths.

METHODS

Study design and setting

This was a retrospective, record-based observational study conducted at the Department of Emergency Medicine and Trauma, Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry, a tertiary care hospital in South India with a bed capacity of approximately 2,100 and an average emergency caseload of 300–350 patients per day. The study period extended over two years, from January 2019 to January 2021. The state health system comprises a multi-tiered network of sub-centers, primary and community health centers, district hospitals, and medical colleges. The study site functions as a major referral center for the union territory and the neighbouring districts of Tamil Nadu.

Study population

The study included all patients who died within 48 hours of initial contact with the ED, as recorded in ED logs. Time of admission was defined as the first point of contact with the ED.

Inclusion criteria

All patients who died within 48 hours of ED admission during the study period were included.

Exclusion criteria

Patients who were brought dead (i.e., without signs of life at the time of ED arrival) were excluded.

The analysis was conducted on a single-group cohort, without comparative arms.

Sampling method and sample size

All eligible cases during the study period were included using consecutive sampling. No prior sample size calculation was performed as this was a census-based study of all qualifying mortality events within the defined time frame. The denominator for 48-hour mortality estimation comprised all emergency department visits during the study period (n=96,560). Deaths occurring after admission to inpatient wards or ICUs were not included, as the study specifically focused on mortality occurring within the emergency department. 132 patients were selected.

Data collection and variables

Data were abstracted from ED medical records, death certificates, and, when available, autopsy reports. Demographic and clinical parameters, timelines of presentation, and interventions were recorded. The cause of death was determined based on documentation by the treating medical officer, supplemented by autopsy findings if available.

Data collected for each case included demographic details (age, gender), clinical characteristics (diagnosis, comorbidities, duration of illness), and relevant scores such as GCS and qSOFA in non-trauma patients.

For trauma cases, variables such as mechanism and timing of injury, associated injuries, pre-hospital care, and substance use were recorded. ED process details including triage level, referrals, time from referral to death, and interventions attempted were also noted. Each case

underwent departmental mortality review, and contributing factors were categorized as organizational, disease-related, human, or technical.

The primary outcome defines the duration of ED stay prior to death, while secondary outcomes included referral-to-death interval and the certified cause of death.

Determination of cause of death and contributory factors

The primary cause of death was assigned based on documentation by the treating emergency physician at the time of death, supported by available investigation results and clinical course.

Autopsy findings were available in a minority of medico-legal cases (approximately one-fourth of MLC deaths) and were used to corroborate the clinical diagnosis where applicable.

All deaths underwent a departmental mortality review conducted by the faculty members in emergency medicine. In instances where there was disagreement regarding the primary cause or contributory factors, consensus was achieved through joint review of clinical records and discussion.

Contributory factors were classified using predefined operational definitions.

Disease-related factors

Advanced disease severity at presentation (e.g., refractory shock, multiorgan failure, catastrophic injury).

Organizational factors

System-level constraints such as delays in referral, unavailability of critical care beds or procedures, or resource limitations.

Human factors

Delays or errors in clinical decision-making, monitoring, or protocol adherence.

Other/Unclassified

Technical failures, mixed factors, or insufficient documentation.

Data management and statistical analysis

Data were entered into Microsoft Excel and analysed using IBM SPSS Statistics version 26. Descriptive statistics were used to summarize patient characteristics and outcomes. Categorical variables were presented as frequencies and percentages. Continuous variables were expressed as mean±standard deviation or median with interquartile range, as appropriate. Comparisons between triage levels or diagnostic categories were conducted using Chi-square tests for categorical variables. Proportions were reported with corresponding 95% confidence intervals (CI), calculated using the Z-distribution method. A p value of <0.05 was considered statistically significant.

Ethical considerations

This study received ethical approval from the Institutional Ethics Committee for Human Studies. As the study involved retrospective data collection from hospital records without direct patient interaction, the need for informed consent was waived by the Ethics Committee.

RESULTS

A total of 96,560 patients attended the Emergency Department during the study period. Of these, 10,848 were admitted, and 132 patients died while under care in the ED.

Among the deaths, 97 (73.5%) were classified as non-MLC, and 35 (26.5%) as MLC. This corresponds to a 48-hour emergency department mortality rate of 1.37 per 1,000 ED visits and 12.2 per 1,000 ED admissions.

Demographic and clinical characteristics

Majority patients who died were between 41–60 years of age (44.7%), followed by those aged 18–40 years (31.1%). Males accounted for 63.6% of all deaths (Table 1). At presentation, 34.1% had an unrecordable pulse, and 37.9% had a mean arterial pressure (MAP) less than 65 mmHg. Over half the patients (53.8%) had a glasgow coma scale (GCS) score of less than 8.

The most common comorbidities were hypertension (16%), diabetes mellitus (13.6%), and chronic kidney disease (10.6%), while 26.5% had no known comorbidities. A qSOFA score >2 was observed in 77% of non-MLC patients who died from sepsis-related causes.

Duration of stay in the emergency deparment prior to death

As shown in Table 2, most patients died within 1–6 hours of ED admission 57.7% of non-MLC and 57.1% of MLC cases. Notably, 26.8% of non-MLC and 20% of MLC deaths occurred within the first hour of arrival. Only a small percentage survived beyond 24 hours in the ED in both groups.

Causes of mortality

In non-MLC cases, cardiac causes (e.g., myocardial infarction, cardiogenic shock) were the most common, accounting for 51.5%, followed by sepsis (26.8%), renal/metabolic causes (6.2%), and malignancy or terminal illness (7.2%). In contrast, among MLC deaths, trauma-related causes (e.g., road traffic accidents, falls, blunt

injury) dominated, comprising 60%. The remaining 40% of MLC deaths were due to non-traumatic causes, including poisoning (20%), burns (8.6%), assault (2.9%), and unclassified causes (8.6%).

Time from referral to death

The interval between pre-hospital referral and death was examined for both MLC and non-MLC cases (Figure 2). Among MLC cases, the majority died within 1–6 hours of referral (62.9%), with only 8.6% surviving beyond 24 hours. A similar trend was observed in non-MLC cases, where 46.6% died within 1–6 hours, and 6.8% beyond 24 hours.

Supportive and contributory factors among MLC cases

Figure 3 illustrates additional contributory factors assessed among MLC deaths. Prehospital measures were documented in 82.9% of cases, and blood transfusion was administered in 40%. Notably, 22.9% of MLC deaths involved patients who were under the influence of alcohol at the time of injury.

Causes of resuscitation failure

The causes of failed resuscitation efforts were grouped and compared across MLC and non-MLC cases (Table 4). In non-MLC deaths, the predominant cause was disease-related (41.2%), followed by organizational delays such as unavailability of critical interventions (24.7%).

A smaller proportion involved human error (6.2%), including delayed decision-making or inadequate monitoring. In MLC deaths, disease-related causes again predominated (65.7%), but the proportion of cases involving human error was higher (17.1%). A small number of cases (5.3%) were grouped as "other/unclassified," which included cases with technical errors, combined factors, or inconclusive post-mortem findings.

Table 1: Baseline demographic and clinical characteristics of ED mortality cases (n=132).

Variable	Subcategory	Frequency (N)	%
Age group (in years)	18–40	41	31.1
	41–60	59	44.7
	>60	32	24.2
Gender	Male	84	63.6
	Female	48	36.4
Pulse at presentation	Not recordable	45	34.1
	Recordable	87	65.9
MAP (mmHg)	<65	50	37.9
	65–85	58	43.9
	>85	24	18.2
GCS at presentation	<8	71	53.8
	≥8	61	46.2
Comorbidities	Hypertension	21	16.0
	Diabetes mellitus	18	13.6
	Chronic kidney disease	14	10.6
	Coronary artery disease	11	8.3
	cy/chronic liver disease	9	6.8
	Multiple comorbidities	24	18.2
	No known comorbidity	35	26.5
Shock at admission	Present	58	43.9
	Absent	74	56.1

Table 2: Duration of stay in emergency department prior to death among MLC and non-MLC cases.

Duration of stay (in hours)	Non-MLC deaths (n=97)	MLC deaths (n=35)
<1	26 (26.8%)	7 (20.0%)
1–6	56 (57.7%)	20 (57.1%)
6–12	6 (6.2%)	3 (8.6%)
12–24	5 (5.2%)	2 (5.7%)
24–48	4 (4.1%)	3 (8.6%)

Table 3: Categorized causes of death among MLC and non-MLC cases (N=132).

Variable	Category	Subcategory	n (%)
Non- MLC (n=97)	**Cardiac**	Cardiogenic shock, etc	50 (51.5)
	Sepsis	k, Sepsis with cancer or comorbidities	26 (26.8)
	Renal/metabolic	CKD, metabolic acidosis, hyperkalemia	6 (6.2)
	CNS	s, status epilepticus, glioma	3 (3.1)
	Pulmonary	ARDS, pulmonary embolism	3 (3.1)
	r/terminal illness	Malignancy, palliative stage disease	7 (7.2)
	GI bleed	UGI bleeding with shock	2 (2.1)
MLC (n=35)	**Trauma**	RTA, falls, polytrauma, blunt injury	21 (60.0)
	Non-trauma	Poisoning (including snake bite)	7 (20.0)
		Burns	3 (8.6)
		Assault	1 (2.9)
		Unclassified	3 (8.6)

Table 4: Causes of resuscitation failure by MLC status (N=132).

Cause of failure	Non-MLC (n=97)	MLC (n=35)	Total (n=132)
Disease-related	40 (41.2%)	23 (65.7%)	63 (47.7%)
Organisational	24 (24.7%)	2 (5.7%)	26 (19.7%)
Human error	6 (6.2%)	6 (17.1%)	12 (9.1%)
Other/Unclassified	3 (3.1%)	4 (11.4%)	7 (5.3%)

DISCUSSION

In this study from a high-volume tertiary care ED in South India, we examined 132 deaths occurring within 48 hours of arrival, representing a mortality rate among admitted patients that warrants attention. With 73.5% being non-MLC and 26.5% MLC, the findings reveal critical insights into both clinical and systemic factors influencing early ED mortality.

A notable 34% of patients presented with unrecordable pulse and 37.9% had MAP <65 mmHg, indicating shock in a significant portion of the cohort. More than half (53.8%) had a GCS<8 at presentation, emphasizing early clinical deterioration. These observations align with India's AITSC trauma registry data, which also correlates poor physiological parameters such as hypotension and low GCS with in-hospital mortality.[2,5] A striking finding of our study is that 20–27% of patients died within the first hour of ED arrival, and over 57% succumbed within six hours (Table 2).

This closely mirrors data from a large South Indian tertiary care ED, where 24-hour mortality was documented at 2.43%, with cardiac and sepsis-related cases being the most common early contributors, and nearly one-quarter deemed preventable due to management delays.[6] Similarly, multi-centre data from urban Indian trauma centres show significant early in-hospital mortality tied to on-arrival physiological derangement such as low blood pressure and GCS underscoring the narrow window for intervention.[7] The findings reinforce that the initial hours after ED presentation are a critical period, demanding heightened preparedness, rapid triage, and aggressive resuscitative care to improve outcomes.

Among non-MLC deaths, cardiac etiologies including myocardial infarction and cardiogenic shock were predominant (51.5%), followed by sepsis (26.8%). These findings align with data from Indian tertiary hospital registries, where cardiovascular events and sepsis are leading causes of early ED mortality. For example, a multicentre Indian study on sepsis reported in-hospital mortality exceeding 36%, with nearly 50% mortality among patients with shock underscoring the high-risk nature of these presentations and the clinical severity at admission (n=1172; 50.8% septic shock mortality).[8]

In contrast, MLC mortalities were dominated by trauma-related deaths (60%), consistent with other Indian forensic casualty audits that show road traffic accidents as the primary MLC category, followed by poisoning and burns.[9] This distinct bifurcation medical deterioration versus injury-driven mortality highlights the necessity for dual-pronged strategies in EDs: robust medical systems for sepsis and cardiac crises, and trauma systems capable of managing high-velocity injuries and toxic exposures effectively.

In the study, more than 60% of both MLC and non-MLC deaths occurred within 1–6 hours of arrival following referral from another healthcare facility, suggesting critical delays in prehospital recognition, stabilization, or transfer. This short survival window reflects systemic issues in the referral chain, where patients often arrive at

tertiary centers in advanced stages of shock or organ dysfunction. Similar patterns have been observed in Indian settings, where delayed or inadequately supported transfers from peripheral hospitals significantly contribute to early ED mortality.[10,11] Strengthening peripheral triage, ensuring appropriate stabilization, and implementing time-sensitive referral protocols are crucial to improving prehospital care and reducing early deaths post-arrival.

When analyzing resuscitation failure (Table 4), disease-related causes were most frequent accounting for 65.7% of MLC and 41.2% of non-MLC deaths. This aligns with findings from a tertiary ED in China, where multi-organ failure and shock were leading predictors of CPR failure and poor in-hospital survival (n=725; MOF predicted failure). In the non-MLC group, organizational factors such as unavailable dialysis or cath lab slots—accounted for 24.7% of failures, which mirrors the experience in Indian trauma centres, where system-level delays in imaging, protocols, and staffing were implicated in preventable deaths.

Conversely, organizational harms were less common in MLC (5.7%), possibly due to the prioritization of trauma cases.[12,13] Human error, including suboptimal monitoring or delayed interventions, comprised 17.1% of MLC failures versus 6.2% in non-MLC, a pattern supported by error analyses in emergency settings using SHERPA methods that confirm the prevalence of action and checking errors in high-pressure ED environments.[14] Rare scenarios involving technical faults, combined failures, or inconclusive post-mortems were grouped under "other/unclassified" to maintain analytical clarity without losing sight of these critical, albeit less frequent, lapses.

Implications for practice

The concentration of mortality within the first six hours of ED arrival highlights the need for targeted system-level interventions. Strengthening prehospital stabilization, enforcing time-based triage escalation for hypotension and altered sensorium, and ensuring rapid access to definitive interventions (such as thrombolysis, dialysis, and trauma imaging) may reduce preventable early deaths. Incorporating standardized indicators such as referral-to-arrival time, proportion of patients presenting in shock, and time-to-critical intervention into routine emergency department audits may enable early identification of system gaps. Future multicentric prospective studies integrating prehospital and ED performance indicators could further refine quality benchmarks for emergency care in India.

Limitations

Although the data were collected between 2019 and 2021, the structural challenges identified such as delayed referrals, late presentation with shock, and resource constraints remain highly relevant in similar high-volume emergency departments across low- and middle-income settings.

CONCLUSION

Mortality within 48 hours of emergency department arrival reflects a convergence of advanced disease severity and system-level constraints. By stratifying medico-legal and non-medico-legal deaths and identifying contributory factors, this study highlights critical opportunities to improve referral pathways, triage processes, and early resuscitative care. Addressing these gaps may meaningfully reduce preventable early emergency department deaths in high-burden settings.

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