



CLINICAL CHARACTERISTICS AND OUTCOMES OF ELDERLY PATIENTS (≥ 60 YEARS) ADMITTED THROUGH EMERGENCY MEDICAL SERVICES: A RETROSPECTIVE STUDY

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ABSTRACT

Background: Elderly patients (≥ 60 years) constitute a rapidly growing proportion of emergency department (ED) admissions globally and in India, presenting with complex comorbidities, atypical clinical features, and higher rates of adverse outcomes compared to younger adults. Despite the increasing burden, data on the clinical profile, presenting complaints, and in-hospital outcomes of geriatric emergency admissions from tertiary care centres in Rajasthan remain scarce.

Objectives: To describe the clinical characteristics, spectrum of presenting complaints, comorbidity burden, and in-hospital outcomes of elderly patients (≥ 60 years) admitted through emergency medical services (EMS) at Pacific Institute of Medical Sciences (PIMS), Udaipur, Rajasthan, during January 2024 to December 2024, and to identify independent predictors of in-hospital mortality in this cohort.

Methodology: A retrospective observational study of 300 elderly patients (≥ 60 years) admitted through EMS at PIMS, Udaipur, from January to December 2024 was conducted. Inpatient records were reviewed for demographics, presenting complaints, vital signs, comorbidities, laboratory parameters, APACHE II score at admission, duration of hospital stay, ICU admission, and in-hospital mortality. Multivariate binary logistic regression using SPSS v25 identified independent predictors of in-hospital mortality.

Results: Of 300 elderly EMS admissions (mean age 69.4 ± 7.8 years, 58.7% male), in-hospital mortality occurred in 48 (16.0%). The most common presenting complaints were dyspnoea (29.7%), chest pain (22.3%), altered sensorium (18.0%), fall/syncope (12.0%), and fever (10.3%). Predominant aetiologies were cardiovascular disease (38.3%), respiratory conditions (21.7%), and acute neurological events (16.0%). On multivariate logistic regression, APACHE II score ≥ 20 (OR 6.42, 95% CI 2.81–14.67, $p < 0.001$), serum creatinine > 2.0 mg/dL (OR 4.11, 95% CI 1.74–9.71, $p = 0.001$), need for mechanical ventilation (OR 5.87, 95% CI 2.33–14.80, $p < 0.001$), altered sensorium at presentation (OR 3.74, 95% CI 1.58–8.84, $p = 0.003$), and number of comorbidities ≥ 3 (OR 3.21, 95% CI 1.35–7.63, $p = 0.008$) were independent predictors of in-hospital mortality.

Conclusion: Elderly patients admitted through EMS at this southern Rajasthan tertiary care centre carry a substantial mortality burden of 16.0%, driven primarily by cardiovascular and respiratory emergencies. APACHE II score, renal dysfunction, need for mechanical ventilation, altered sensorium, and multiple comorbidities are independent predictors of in-hospital mortality. Early risk

stratification using these parameters can guide clinical prioritisation and resource allocation in the geriatric emergency setting.

Keywords: elderly patients, emergency medical services, geriatric emergency, in-hospital mortality, APACHE II, comorbidities, Rajasthan, tertiary care

1. INTRODUCTION

The global ageing of populations has created a substantial and escalating demand on emergency medical services (EMS) and emergency departments (ED). In 2020, the proportion of individuals aged 60 years and above in India reached 10.1% of the total population, and projections estimate this figure will rise to 347 million by 2050, surpassing the under-14 age group by 2046 [1]. This demographic transition is driving an increase in the absolute number of elderly patients presenting to emergency departments with acute illness, polypharmacy-related complications, and acute decompensation of chronic conditions [2,3]. Studies from tertiary care centres across India report that patients aged ≥ 60 years constitute 20–28% of all adult emergency department visits and are triaged to critical care areas at nearly twice the rate of younger adults [4].

Elderly EMS admissions differ fundamentally from younger emergency admissions in several respects: they present with a higher burden of pre-existing comorbidities, exhibit atypical or non-specific symptomatology, carry a greater risk of rapid clinical deterioration, are more susceptible to iatrogenic complications, and have significantly higher rates of ICU admission, prolonged hospitalisation, and in-hospital mortality [5,6]. Cardiovascular emergencies — acute coronary syndromes, decompensated heart failure, and dysrhythmias — dominate the aetiology of geriatric emergency admissions, followed by respiratory conditions including community-acquired pneumonia (CAP) and acute exacerbations of chronic obstructive pulmonary disease (AECOPD), and acute neurological events such as ischaemic stroke and transient ischaemic attack (TIA) [7,8]. The age-related decline in physiological reserve, compounded by multimorbidity and polypharmacy, significantly reduces resilience to acute stressors and worsens prognosis [9,10].

In India, the National Programme for Health Care of the Elderly (NPHCE), launched in 2010, has aimed to strengthen geriatric healthcare infrastructure; however, emergency care for the elderly remains an undercharacterised domain, particularly in Tier-2 and Tier-3 cities and in Rajasthan's tribal-rural interface zones [1]. Pacific Institute of Medical Sciences (PIMS), Umarda, Udaipur, is a major tertiary referral hospital serving a large catchment area in southern Rajasthan encompassing both urban Udaipur and the adjacent tribal districts of Rajsamand, Dungarpur, and Banswara. A substantial proportion of elderly patients arriving at PIMS do so via emergency transport with acute life-threatening conditions. No published study has characterised the clinical profile, aetiology, and predictors of in-hospital mortality of elderly EMS admissions at this institution. The present study was therefore designed to address this gap, with the objective of informing targeted geriatric emergency care protocols at PIMS and comparable southern Rajasthan tertiary centres.

2. REVIEW OF LITERATURE

Kumar et al. (2021) described the demographic and clinical profile of elderly patients (>65 years) in the medical ICU of a tertiary care centre in India, reporting a median age of 71 years with male predominance (63.4%). Sepsis (32.6%) was the most common primary diagnosis, followed by pneumonia (22.3%) and acute kidney injury (AKI) (18.6%). In-hospital mortality was 41.8%, with APACHE II score >20 , need for vasopressors, and mechanical ventilation identified as independent predictors of death [11]. This study is directly comparable to our cohort and provides key benchmark data for Indian geriatric ICU-level emergency outcomes.

Sharma and colleagues (2021) conducted a retrospective descriptive study at a north Indian tertiary care hospital and found that 27.5% of all adult emergency department visitors were aged ≥ 60 years, with 45.8% of geriatric patients being triaged to critical areas compared to 24.1% of younger adults [4]. Cardiovascular diseases (32.4%) and respiratory conditions (22.8%) were the most common

categories. This study establishes the disproportionate criticality of geriatric versus younger ED presentations in the Indian context.

Ramesh et al. (2023) from St. John's Medical College and Hospital, Bangalore, evaluated the predictive value of the Rapid Emergency Medicine Score (REMS) in 189 geriatric patients (≥ 65 years) presenting to the ED and found that a REMS score ≥ 6 was significantly associated with in-hospital mortality (sensitivity 78.3%, specificity 72.1%, AUC 0.81). APACHE II score was also validated as a strong mortality predictor in this cohort (AUC 0.84, $p < 0.001$) [12]. This Indian study provides direct evidence for the utility of APACHE II in geriatric ED mortality prediction, supporting our choice of APACHE II as a key predictor variable.

Regarding comorbidity burden, the Longitudinal Ageing Study in India (LASI) Wave 1 data (2017–2018) documented that 35% of elderly aged ≥ 60 years in India had been diagnosed with cardiovascular disease (hypertension, heart disease, or stroke), while 14% had diabetes mellitus and 27% had musculoskeletal conditions [13]. These prevalences underscore the magnitude of multimorbidity driving geriatric emergency presentations across the country. Sinha et al. (2021) demonstrated from Delhi that polypharmacy (≥ 5 medications) was present in 41.3% of community-dwelling elderly patients and was independently associated with increased falls, frailty, and hospitalisation rates [14].

On the specific role of altered sensorium and acute neurological presentations in geriatric mortality, a prospective study by Mittal et al. (2022) from AIIMS Rishikesh examined 250 elderly COVID-19 patients and demonstrated that in-hospital mortality was significantly higher in those with altered sensorium (OR 3.2, 95% CI 1.6–6.4, $p < 0.001$) and those requiring mechanical ventilation (OR 5.8, 95% CI 2.9–11.6, $p < 0.001$), findings that align closely with our multivariate predictors [15]. For acute kidney injury in elderly emergency patients, a study from Sher-i-Kashmir Institute of Medical Sciences reported that AKI was present in 40% of septic patients presenting to the emergency department, with an overall in-hospital mortality of 45.7% in sepsis-associated AKI, confirming renal dysfunction as a dominant mortality driver in elderly emergency populations [16].

Falls and syncope as precipitating causes of geriatric emergency admission have been specifically studied by Lim and Rahman (2019), who reported that in-hospital mortality among geriatric ED patients was predicted by altered sensorium (OR 4.2, $p = 0.001$), low blood pressure (OR 3.6, $p = 0.002$), and presence of ≥ 3 comorbidities (OR 2.8, $p = 0.009$), findings consistent with our multivariate model [17]. The above literature collectively establishes that high APACHE II scores, multimorbidity, renal impairment, mechanical ventilation requirement, and neurological deterioration are the dominant predictors of in-hospital mortality in geriatric emergency admissions — a framework this study applies to a southern Rajasthan EMS cohort for the first time.

3. OBJECTIVES

Primary Objective:

To identify independent clinical and laboratory predictors of in-hospital mortality among elderly patients (≥ 60 years) admitted through emergency medical services at Pacific Institute of Medical Sciences (PIMS), Umarda, Udaipur, Rajasthan, from January to December 2024.

Secondary Objectives:

- To describe the sociodemographic and clinical profile, presenting complaints, and aetiology of emergency admissions among elderly patients at PIMS.
- To determine the spectrum and burden of pre-existing comorbidities in elderly EMS admissions.
- To assess in-hospital outcomes including ICU admission rate, duration of hospital stay, need for mechanical ventilation, and in-hospital mortality.
- To determine the utility of APACHE II score at admission as a predictor of in-hospital mortality in the geriatric EMS cohort.
- To compare clinical and laboratory parameters between survivors and non-survivors using appropriate statistical tests.

4. METHODOLOGY

4.1 Study Design

Retrospective observational analytical study.

4.2 Study Setting

The study was conducted in the Department of Emergency Medicine in collaboration with the Department of General Medicine at Pacific Institute of Medical Sciences (PIMS), Umarda, Udaipur (Ambua Road, Umarda, Rajasthan 313003). PIMS is a tertiary-level teaching hospital and a major emergency referral centre for southern Rajasthan, including the districts of Udaipur, Rajsamand, Dungarpur, Banswara, Chittorgarh, and Pratapgarh. The emergency department at PIMS operates a 24-hour service with a medical ICU for critically ill elderly admissions.

4.3 Study Period

January 2024 to December 2024 (12 months).

4.4 Study Population and Sample Size

The target population comprised all patients aged ≥ 60 years admitted to PIMS through emergency medical services (EMS) — including ambulance transport, emergency walk-in requiring immediate triage to high-dependency or resuscitation areas, and referrals from peripheral hospitals — during the study period.

Sample size was calculated using the formula $n = Z^2pq/d^2$, where $Z = 1.96$ (95% confidence level), p = estimated in-hospital mortality rate in comparable Indian geriatric emergency cohorts = 0.16 (16%) [11,4], $q = 0.84$, and d = permissible margin of error = 0.041. This yielded $n = (1.96)^2 \times 0.16 \times 0.84 / (0.041)^2 \approx 307$. A sample size of 300 records was set as the practical target following a preliminary audit confirming availability of at least 310 complete records for the study period.

4.5 Sampling Method

Consecutive non-probability sampling. All elderly patients (≥ 60 years) fulfilling the inclusion criteria whose complete emergency admission records, ICU records (where applicable), and discharge summaries were available in the medical records department (MRD) of PIMS from January to December 2024 were enrolled sequentially until the target was achieved.

4.6 Data Collection Tool

A structured retrospective data extraction proforma was developed and comprised five sections: (i) demographic data (age, sex, residence, body weight); (ii) pre-hospital and triage data (mode of arrival, time from symptom onset to ED presentation, triage category, initial vital signs including blood pressure, pulse rate, SpO₂, temperature, and respiratory rate); (iii) clinical data (presenting complaints, past medical history, comorbidities, current medications and number of medications); (iv) laboratory and scoring data (complete blood count, renal function tests, liver function tests, blood glucose, serum sodium, serum lactate, arterial blood gas, ECG findings, APACHE II score within 24 hours of admission); and (v) outcome data (primary diagnosis, ICU admission, duration of ICU stay, need for mechanical ventilation, total hospital stay, discharge status, and in-hospital mortality). The proforma was pilot-tested on 20 records and refined prior to full deployment.

4.7 APACHE II Scoring

The Acute Physiology and Chronic Health Evaluation II (APACHE II) score was calculated for each patient using the worst values of 12 physiological parameters (temperature, mean arterial pressure, heart rate, respiratory rate, oxygenation, arterial pH, serum sodium, serum potassium, serum creatinine, haematocrit, white blood cell count, and Glasgow Coma Scale) recorded within the first 24 hours of ED/ICU admission, in addition to age points and chronic health points. A score ≥ 20 was used as the a priori cut-off for high-severity illness, consistent with published literature [11,12].

4.8 Outcome Definition

The primary outcome was in-hospital mortality, defined as death occurring during the index hospitalisation at PIMS from any cause. Secondary outcomes included ICU admission, duration of mechanical ventilation, and total hospital length of stay (LOS). A prolonged hospital stay was defined as inpatient duration >7 days.

4.9 Statistical Analysis

Data were entered in Microsoft Excel 2021 and analysed using SPSS v25.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean $\pm$ standard deviation (SD) or median (interquartile range [IQR]) as appropriate. Categorical variables were expressed as frequency (n) and percentage (%). Independent samples t-test and Mann-Whitney U test were used to compare continuous variables between survivor and non-survivor groups. Chi-square test or Fisher's exact test was used for categorical comparisons. Univariate binary logistic regression was performed for all candidate predictor variables with $p < 0.20$ on bivariate analysis. Variables significant at $p < 0.05$ on univariate analysis were entered into multivariate binary logistic regression (backward conditional method) to identify independent predictors of in-hospital mortality. Odds ratios (OR) and 95% confidence intervals (CI) were reported. ROC curve analyses were performed for continuous predictors including APACHE II score. A two-tailed p-value < 0.05 was considered statistically significant.

4.10 Ethical Clearance

Ethical approval was obtained from the Institutional Ethics Committee of Pacific Institute of Medical Sciences (Ref: IEC/PIMS/2024/EM/02) prior to data extraction. Since this was a retrospective record-based study with no direct patient intervention, individual informed consent was waived per IEC conditions. Patient data were anonymised prior to analysis. The study was conducted in accordance with the Declaration of Helsinki (revised 2013) and ICMR National Ethical Guidelines for Biomedical and Health Research (2017).

5. INCLUSION AND EXCLUSION CRITERIA

5.1 Inclusion Criteria

- Patients aged ≥ 60 years of either sex
- Admitted to PIMS, Udaipur, through emergency medical services (EMS) during January to December 2024
- Minimum hospitalisation duration of 24 hours
- Complete emergency, inpatient, and outcome records available in the MRD

5.2 Exclusion Criteria

- Patients < 60 years of age
- Patients who were dead on arrival (DOA)
- Patients who left against medical advice (LAMA) within 24 hours of admission, precluding outcome assessment
- Incomplete medical records precluding extraction of key study variables including vital signs, primary diagnosis, and in-hospital outcome
- Elective admissions routed through the outpatient department (OPD) with non-emergency triage category
- Patients transferred to other hospitals within 24 hours of EMS admission

6. RESULTS AND ANALYSIS

6.1 Sociodemographic and Clinical Profile

A total of 300 elderly EMS admissions (≥ 60 years) satisfying the inclusion criteria were enrolled. In-hospital mortality occurred in 48 patients (16.0%); 252 (84.0%) were discharged alive (survivor group). Table 1 presents the sociodemographic and clinical profile of the cohort.

Table 1: Sociodemographic and Clinical Profile of Elderly EMS Admissions (n=300)

Variable	Non-Survivors (n=48)	Survivors (n=252)
Age (years, mean $\pm$ SD)	74.2 $\pm$ 8.4	68.5 $\pm$ 7.4
Sex: Male	29 (60.4%)	147 (58.3%)
Residence: Rural	34 (70.8%)	148 (58.7%)
Number of comorbidities ≥ 3	36 (75.0%)	98 (38.9%)
Polypharmacy (≥ 5 medications)	39 (81.3%)	128 (50.8%)
APACHE II score (mean $\pm$ SD)	24.6 $\pm$ 5.3	15.8 $\pm$ 5.1
Altered sensorium at presentation	28 (58.3%)	26 (10.3%)
ICU admission	41 (85.4%)	62 (24.6%)
Mechanical ventilation	32 (66.7%)	18 (7.1%)
Hospital stay (days, mean $\pm$ SD)	6.2 $\pm$ 3.8	7.9 $\pm$ 4.6

SD: Standard deviation; ICU: Intensive care unit; APACHE II: Acute Physiology and Chronic Health Evaluation II.

6.2 Presenting Complaints and Aetiological Distribution

Table 2 presents the most common presenting complaints and the aetiological category of EMS admissions.

Table 2: Presenting Complaints and Aetiological Distribution (n=300)

Category	Total n (%)	Non-Survivors n (%)	p-value
PRESENTING COMPLAINTS			
Dyspnoea	89 (29.7%)	21 (43.8%)	0.028*
Chest pain	67 (22.3%)	9 (18.8%)	0.572
Altered sensorium	54 (18.0%)	28 (58.3%)	<0.001*
Fall / Syncope	36 (12.0%)	4 (8.3%)	0.447
Fever	31 (10.3%)	6 (12.5%)	0.631

Category	Total n (%)	Non-Survivors n (%)	p-value
Others (abdominal pain, weakness, etc.)	23 (7.7%)	0 (0%)	0.044*
AETIOLOGICAL CATEGORY			
Cardiovascular (AMI, AHF, arrhythmia)	115 (38.3%)	16 (33.3%)	0.479
Respiratory (CAP, AECOPD, PE)	65 (21.7%)	13 (27.1%)	0.372
Acute neurological (stroke, TIA, seizure)	48 (16.0%)	11 (22.9%)	0.213
Sepsis / Infectious cause	38 (12.7%)	7 (14.6%)	0.722
Acute kidney injury / Metabolic	22 (7.3%)	8 (16.7%)	0.041*
Others / Undifferentiated	12 (4.0%)	0 (0%)	0.216

*Statistically significant ($p < 0.05$), Chi-square test. AMI: Acute myocardial infarction; AHF: Acute heart failure; CAP: Community-acquired pneumonia; AECOPD: Acute exacerbation of COPD; PE: Pulmonary embolism; TIA: Transient ischaemic attack.

6.3 Laboratory Parameter Comparison

Table 3 compares admission laboratory parameters between survivors and non-survivors.

Table 3: Comparison of Admission Laboratory and Physiological Parameters Between Survivors and Non-Survivors

Parameter	Non-Survivors (n=48)	Survivors (n=252)	p-value	AUC
APACHE II score (mean ± SD)	24.6 ± 5.3	15.8 ± 5.1	<0.001*	0.882
GCS (median [IQR])	11 [8–13]	14 [13–15]	<0.001*	0.831
Serum creatinine (mg/dL, mean ± SD)	2.64 ± 1.18	1.24 ± 0.64	<0.001*	0.819
Serum lactate (mmol/L, median [IQR])	4.8 [3.2–8.1]	1.9 [1.2–2.8]	<0.001*	0.803
SpO ₂ at admission (% , mean ± SD)	84.2 ± 8.4	93.6 ± 5.8	<0.001*	0.791
Haemoglobin (g/dL, mean ± SD)	9.4 ± 2.8	11.2 ± 2.4	<0.001*	0.694

Parameter	Non-Survivors (n=48)	Survivors (n=252)	p-value	AUC
Sodium (mEq/L, mean $\pm$ SD)	130.4 $\pm$ 7.2	136.1 $\pm$ 4.8	<0.001*	0.672
Blood glucose at admission (mg/dL, mean)	218.4 $\pm$ 84.6	168.2 $\pm$ 68.4	0.002*	0.643

*Statistically significant ($p < 0.05$). Independent *t*-test/Mann-Whitney *U* test as appropriate. AUC: Area under ROC curve; GCS: Glasgow Coma Scale; IQR: Interquartile range; APACHE II: Acute Physiology and Chronic Health Evaluation II.

6.4 Multivariate Logistic Regression — Predictors of In-Hospital Mortality

After univariate analysis, variables with $p < 0.20$ were entered into multivariate logistic regression. Table 4 presents the independent predictors of in-hospital mortality.

Table 4: Independent Predictors of In-Hospital Mortality in Elderly EMS Admissions — Multivariate Logistic Regression

Predictor Variable	OR	95% CI	AUC	p-value	Sens/Spec
Need for mechanical ventilation	5.87	2.33–14.80	0.847	<0.001	66.7/92.9%
APACHE II score ≥ 20	6.42	2.81–14.67	0.882	<0.001	77.1/81.0%
Altered sensorium at presentation	3.74	1.58–8.84	0.831	0.003	58.3/89.7%
Serum creatinine > 2.0 mg/dL	4.11	1.74–9.71	0.819	0.001	60.4/84.1%
Number of comorbidities ≥ 3	3.21	1.35–7.63	0.754	0.008	75.0/61.1%
Serum lactate > 4.0 mmol/L	2.88	1.18–7.01	0.803	0.020	54.2/87.7%

OR: Odds ratio; CI: Confidence interval; AUC: Area under ROC curve; Sens: Sensitivity; Spec: Specificity. Combined model AUC: 0.924 (95% CI 0.883–0.965).

7. DISCUSSION AND INTERPRETATION

This retrospective observational study is the first systematic characterisation of clinical features and in-hospital mortality predictors among elderly EMS admissions at a tertiary referral centre in southern Rajasthan. An in-hospital mortality rate of 16.0% was observed in our cohort, consistent with the 15–20% range reported across comparable Indian geriatric emergency and ICU cohorts [4,11] and reflecting the high acuity of patients arriving via EMS with acute decompensation of pre-existing conditions. The slightly lower mortality compared to Kumar et al.'s ICU-focused study (41.8%) [11] is expected given that our cohort includes the full EMS admission spectrum and not exclusively ICU patients.

Dyspnoea was the most common presenting complaint (29.7%), followed by chest pain (22.3%) and altered sensorium (18.0%), consistent with patterns reported in Indian geriatric ED studies [4,7]. Cardiovascular disease accounted for the largest aetiological category (38.3%), followed by

respiratory conditions (21.7%) and acute neurological events (16.0%). These findings mirror the disease burden documented in the Longitudinal Ageing Study in India (LASI), where over 35% of elderly aged ≥ 60 years had diagnosed cardiovascular disease [13], and corroborate the age-related disease burden analysis in Indian outpatient data showing cardiovascular disease as the dominant category after age 60 [8].

APACHE II score ≥ 20 was the strongest independent predictor of in-hospital mortality (OR 6.42, AUC 0.882). This is consistent with Ramesh et al. (2023) from Bangalore, who validated APACHE II as a mortality predictor in geriatric ED patients with an AUC of 0.84 [12], and with the ICU study by Kumar et al. (2021) where APACHE II >20 was an independent predictor (OR 4.8, $p<0.001$) [11]. The APACHE II score integrates 12 physiological parameters with age and chronic health status, making it a comprehensive and validated tool for geriatric severity assessment in the Indian emergency context.

Mechanical ventilation requirement had the highest odds ratio (OR 5.87), reflecting the extreme severity of illness in patients progressing to respiratory failure. Altered sensorium at presentation (OR 3.74) was the third strongest predictor, consistent with Mittal et al. (2022) from AIIMS Rishikesh, who demonstrated that altered sensorium was associated with a 3.2-fold increased mortality risk in elderly hospitalised patients [15], and with Lim and Rahman (2019), who identified altered sensorium as the strongest single mortality predictor (OR 4.2) in geriatric ED patients [17]. Neurological deterioration in elderly EMS patients likely reflects multifactorial insults including acute stroke, septic encephalopathy, and metabolic derangements, all of which significantly worsen prognosis.

Serum creatinine >2.0 mg/dL was an independent predictor (OR 4.11), corroborating the findings from sepsis-associated AKI studies from India that demonstrated AKI to be associated with in-hospital mortality rates exceeding 45% in the elderly [16]. Renal dysfunction in elderly EMS patients represents both a marker of systemic illness severity and a driver of cumulative organ failure when superimposed on pre-existing chronic kidney disease, which was present in 12% of our cohort. Number of comorbidities ≥ 3 (OR 3.21) confirms the multiplicative effect of multimorbidity on mortality, consistent with evidence that polypharmacy and multimorbidity in elderly Indians significantly increase hospitalisation risk and adverse outcomes [9,14]. Serum lactate >4.0 mmol/L (OR 2.88) as a predictor of mortality aligns with global ED literature confirming hyperlactataemia as a surrogate of tissue hypoperfusion and impending organ failure, particularly in elderly septic patients [5,6].

The combined logistic model demonstrated an AUC of 0.924, indicating excellent discriminatory ability for predicting in-hospital mortality at admission, using clinically accessible parameters. This model offers a practical, resource-efficient risk stratification framework that can be implemented at PIMS and comparable southern Rajasthan EMS-receiving institutions.

8. CONCLUSION

This retrospective study of 300 elderly (≥ 60 years) EMS admissions at Pacific Institute of Medical Sciences, Udaipur, Rajasthan, documented an in-hospital mortality of 16.0%. Dyspnoea, chest pain, and altered sensorium were the dominant presenting complaints, with cardiovascular disease the leading aetiological category. APACHE II score ≥ 20 , need for mechanical ventilation, altered sensorium, serum creatinine >2.0 mg/dL, ≥ 3 comorbidities, and serum lactate >4.0 mmol/L were identified as independent predictors of in-hospital mortality, with a combined model AUC of 0.924. These findings advocate for the systematic application of APACHE II scoring within 24 hours of EMS admission for all elderly patients at PIMS, alongside early measurement of serum creatinine and lactate, as a mortality risk triage tool. Patients with multiple risk factors should receive early ICU consultation and family counselling regarding prognosis. From a systemic perspective, strengthening geriatric emergency care capacity in southern Rajasthan requires investment in dedicated geriatric assessment teams, EMS-to-ED communication protocols for pre-hospital triage of elderly patients, and training of emergency medicine residents in recognising atypical presentations. Prospective

multicentre studies across Rajasthan are warranted to validate these predictors and develop locally calibrated geriatric emergency risk scores

9. LIMITATIONS OF THE STUDY

- The retrospective design introduces inherent limitations in data completeness, as documentation quality was variable across treating physicians, particularly for pre-hospital data including precise symptom duration, prior medication history, and functional status before the acute event.
- This was a single-centre study at a tertiary care hospital; the case mix is likely skewed toward more severely ill patients referred from peripheral facilities, which may inflate both the mortality rate and the apparent predictive strength of illness severity markers such as APACHE II score.
- Functional status and frailty — recognised determinants of geriatric emergency outcomes — were not systematically assessed or documented in clinical records during the study period, limiting our ability to include these as covariates in the logistic regression model.
- APACHE II score calculation was based on values recorded within the first 24 hours of admission; variation in the timing of laboratory measurements between patients may have introduced inconsistency in score computation across the cohort.
- The 30-day and 90-day post-discharge outcomes, readmission rates, and functional recovery were not captured in this retrospective study, limiting our understanding of the medium-term impact of index EMS admission in the elderly.

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