Volume 3, Issue 4, 2025

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

CLINICAL PROFILE OF NON-TRAUMATIC PATIENTS WITH ALTERED MENTAL STATUS PRESENTING TO THE EMERGENCY DEPARTMENT OF A TERTIARY CARE HOSPITAL

Dr. Dua Muddassir[*1], Dr. Sanober Sikander[2]

[*1]*Post-graduate Resident, Department of Accident and Emergency, Jinnah Post-graduate Medical Centre, Karachi*
[2]*Consultant and Supervisor, Department of Accident and Emergency, Jinnah Post-graduate Medical Centre, Karachi*

[*1]duamuddassir@gmail.com, [2]drsanoberjpmc@gmail.com

DOI: https://doi.org/10.5281/zenodo.23996862

Keywords
Altered Mental Status, Emergency Department, Glasgow Coma Scale, Metabolic Encephalopathy, Sepsis, Stroke.

Article History
Received: 07 April 2025
Accepted: 19 May 2025
Published: 05 June 2025

Copyright @Author
Corresponding Author: *
Dr. Dua Muddassir

Abstract

Objective: *To determine the clinical profile of adult patients with non-traumatic altered mental status (AMS) in terms of demographic characteristics, presenting features, initial physiological and neurological findings, etiological categories, and emergency department (ED) disposition.*

Study Design: *Descriptive cross-sectional study.*

Setting: *Emergency Department, Jinnah Postgraduate Medical Centre, Karachi.*

Period: *December 2024 to March 2025 (four months).*

Methods: *A total of 195 adults with acute non-traumatic AMS were enrolled through non-probability purposive sampling. Demographic, clinical, laboratory and imaging data, the primary etiology and ED disposition were recorded on a structured proforma. Data were analyzed using SPSS version 26, and proportions were reported with 95% confidence intervals (CI).*

Results: *The median age was 55 (IQR 39–70) years and 49.7% were male. Half the patients (50.8%) presented more than 72 hours after onset, and 45.1% had a Glasgow Coma Scale (GCS) of 3–8. Systemic infection/sepsis and metabolic/endocrine disorders were the leading causes (28.2% each; 95% CI 22.4–34.9%), followed by stroke (13.3%), seizure/post-ictal states (8.2%), toxicological causes (7.7%) and respiratory failure (7.2%). Overall, 31.3% were admitted to wards, 27.7% to HDU/ICU and 22.6% were transferred; 11.3% died in the ED, all with GCS ≤8. Initial GCS (adjusted OR 0.62 per point; 95% CI 0.49–0.78) and anaemia (adjusted OR 3.33; 95% CI 1.10–10.10) were independently associated with ED death.*

Conclusion: *Sepsis and metabolic derangements were the leading causes of non-traumatic AMS, and most patients presented late with severe impairment of consciousness. A low initial GCS identified patients at highest risk of death in the ED.*

INTRODUCTION

Altered mental status (AMS) describes an acute change in behaviour, cognition or level of consciousness, ranging from mild confusion to deep coma. It is a syndrome rather than a diagnosis and requires rapid identification of reversible causes such as hypoglycaemia, hypoxia, infection, seizures and intoxication. In the United States, AMS accounted for 3.1% of all ED visits, approximately 4.5 million visits each year; 60.3% of these patients arrived by ambulance and only 38% were discharged home.[1] A four-year multicentre Korean study reported a similar frequency of 3.1%, which rose

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

after the COVID-19 pandemic, with overall mortality increasing from 13.5% to 18.4%.[2] Altered consciousness in emergency patients is consistently linked with poor outcomes, and the GCS remains a quick bedside tool that needs no equipment for grading its severity.[3]

The causes of AMS differ widely between settings. In a Korean study of 2,028 patients, systemic infection (28.6%) and metabolic causes (22.4%) predominated, followed by stroke (13.4%), and overall mortality was 17.2%;[4] a multicentre Korean cohort likewise found metabolic causes to be the most frequent (24.7%).[5] In Egypt, systemic infection (25.3%) and respiratory causes (24.1%) led, with a mortality of 25.3%,[6] whereas a Saudi academic ED reported neurological causes and drug abuse (24.6% each) as most common.[7] Studies from India and Nepal found neurological and cerebrovascular causes to be leading, with mortality of 20–42%.[8,9] In Pakistan, Khan et al. reported sepsis (33.3%) followed by stroke (20%) among 60 patients in Karachi, with 20% mortality,[10] while Batool et al. found cerebrovascular events (31.1%) to predominate in Rawalpindi, with in-hospital mortality of 25.5%.[11] Studies from sub-Saharan Africa have reported even higher short-term mortality, reaching 35–66%, with a low GCS identified as a predictor of death in non-traumatic coma.[12,13]

JPMC is a large public tertiary care hospital that serves a heterogeneous population from Karachi and beyond and receives many patients with severe infection, vascular disease, metabolic derangement, poisoning and delayed presentation. However, local data on the spectrum of non-traumatic AMS remain limited to small samples, and the relationship between presenting severity and ED outcome has not been described in this population. Knowledge of the leading and treatable causes would help prioritize early investigations and resources and inform an AMS pathway for EDs in Pakistan. Therefore, this study was conducted to determine the clinical profile of adult patients with non-traumatic AMS in terms of demographic characteristics, presenting features, initial physiological and neurological findings, etiological categories and ED disposition.

METHODS

This descriptive cross-sectional study was conducted in the Emergency Department of Jinnah Postgraduate Medical Centre (JPMC), Karachi, over four months from December 2024 to March 2025, after approval from the Research Evaluation Unit of the College of Physicians and Surgeons Pakistan and the Institutional Review Board of JPMC. The sample size was calculated with the WHO formula for a single population proportion, taking the proportion of sepsis among AMS patients as 33.3%,[10] a 95% confidence level and an absolute precision of 7%. This gave 175 patients, which was increased by 10% for incomplete forms to a final sample of 195. Non-probability purposive sampling was used.

Patients aged 18 years or above of either gender, with an acute AMS present at arrival or recognized during the ED stay, a non-traumatic origin on history and initial assessment, and presentation within seven days of onset were included. AMS was defined as an acute change in mental status resulting in confusion, disorientation, impaired attention, abnormal behaviour, agitation, drowsiness, stupor or coma, documented by the clinician and verified by a reliable source. Patients were excluded if head injury or other significant trauma was judged to be the primary cause, if they had known dementia, intellectual disability, chronic psychosis or a persistent neurological deficit without an acute change from baseline, if sedative or neuromuscular-blocking drugs had been given before a reliable GCS assessment, if they arrived in cardiac arrest without return of spontaneous circulation before neurological assessment, or if consent was refused. Written informed consent was obtained from capable patients and otherwise from a legally authorized representative.

The principal investigator and trained emergency residents recorded age, gender, source of history, onset and pattern of AMS, associated features, comorbidities, initial vital signs, random blood glucose, GCS with its components, pupils, focal neurological deficit and neck stiffness on a structured proforma. Results of routine investigations (complete blood count, electrolytes, renal and liver function, arterial blood gases and neuroimaging) were recorded when performed as part of care;

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

no additional tests were ordered for the study. At the time of ED disposition, the treating physician assigned one primary etiological category using the available clinical, laboratory and imaging evidence. Systemic infection/sepsis was defined according to the Sepsis-3 criteria adopted by the Surviving Sepsis Campaign.[14] GCS severity was classified as mild (13–14), moderate (9–12) or severe (3–8). ED disposition was recorded as discharged, admitted to ward, admitted to HDU/ICU, transferred/referred, left against medical advice or died in the ED; HDU/ICU admission or death in the ED was combined as a critical outcome. Anaemia was defined as haemoglobin <13 g/dL in men and <12 g/dL in women, and hypotension as systolic blood pressure <90 mmHg.

Data were analyzed using IBM SPSS Statistics version 26. Normality was assessed with the Shapiro–Wilk test; as all continuous variables were non-normally distributed, they were presented as median and interquartile range (IQR). Categorical variables were presented as frequencies and percentages, and the etiological categories and ED disposition were reported with 95% CI (Wilson score method). Exploratory comparisons across etiological groups, GCS severity groups and between ED deaths and survivors used the chi-square test, or Fisher's exact/Fisher–Freeman–Halton exact test (Monte Carlo, 10,000 samples) when expected counts were small, and the Mann–Whitney U or Kruskal–Wallis test for continuous variables. Variables with $p < 0.05$ (ED death) or $p < 0.10$ (critical outcome) on univariable analysis were entered into binary logistic regression models, and receiver operating characteristic (ROC) analysis assessed the discriminative ability of initial GCS. A p-value <0.05 was considered statistically significant.

RESULTS

A total of 195 patients were enrolled. The median age was 55 (IQR 39–70) years (mean 55.3 ± 18.9 years), 75 (38.5%) were older than 60 years, and 97 (49.7%) were male. The history was obtained mainly from relatives (83.6%). The median duration of AMS before arrival was 73 (IQR 39.5–116) hours; 99 (50.8%) patients presented after 72 hours and only 5 (2.6%) within 6 hours. Stupor/coma was the predominant pattern (45.1%). Fever (32.3%) and reduced oral intake (31.3%) were the most frequent associated features, while diabetes mellitus (35.9%) and hypertension (33.3%) were the commonest comorbidities; 76 (39.0%) patients had two or more comorbidities. (Table-I)

TABLE-I: Demographic and presenting characteristics of patients with non-traumatic AMS (n=195)

Variable	**n** (%)
Age (years), median (IQR)	55 (39–70)
Age (years), mean ± SD	55.3 ± 18.9
Age group	
18–40 years	51 (26.2)
41–60 years	69 (35.4)
>60 years	75 (38.5)
Gender	
Male	97 (49.7)
Female	98 (50.3)
Source of history	
Relative	163 (83.6)
Patient	17 (8.7)
Bystander/EMS	15 (7.7)
Duration of AMS before arrival	

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

Variable	n (%)
<6 hours	5 (2.6)
6–24 hours	28 (14.4)
>24–72 hours	63 (32.3)
>72 hours–7 days	99 (50.8)
Main AMS pattern	
Confused/disoriented	25 (12.8)
Agitated	24 (12.3)
Drowsy	58 (29.7)
Stupor/coma	88 (45.1)
Associated features*	
Fever	63 (32.3)
Reduced oral intake	61 (31.3)
Breathlessness	43 (22.1)
Headache/vomiting	42 (21.5)
Focal weakness	27 (13.8)
Seizure	24 (12.3)
Suspected poisoning/overdose	15 (7.7)
Comorbidities*	
Diabetes mellitus	70 (35.9)
Hypertension	65 (33.3)
Chronic lung disease	29 (14.9)
Chronic kidney disease	24 (12.3)
Prior stroke	23 (11.8)
Epilepsy	16 (8.2)
Chronic liver disease	16 (8.2)
No known comorbidity	42 (21.5)
Two or more comorbidities	76 (39.0)

**Multiple responses; percentages do not total 100. IQR: interquartile range; SD: standard deviation; EMS: emergency medical services.*

On arrival, the median GCS was 9 (IQR 7–12.5), and 88 (45.1%) patients had severe impairment (GCS 3–8). Tachypnoea (51.3%), tachycardia (48.7%) and a positive qSOFA (56.4%) were common, while hypoxaemia and hypotension were present in 19.0% and 6.2%, respectively. Hypoglycaemia was found in 7.2% and marked hyperglycaemia in 20.0%. Anaemia (57.4%) and raised creatinine (47.2%) were the most frequent laboratory abnormalities. Neuroimaging was performed in 84 (43.1%) patients and was abnormal in 26 (31.0% of those imaged), all due to stroke. (Table-II)

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

TABLE-II: Initial physiological, neurological and laboratory findings (n=195)

Parameter	Median (IQR) / n (%)
Vital signs and glucose	
Temperature (°C)	37.3 (36.8–38.5)
Pulse (beats/min)	99 (81–113)
Systolic blood pressure (mmHg)	121 (106.5–150)
Respiratory rate (breaths/min)	22 (18–27)
SpO2 (%)	95 (92–98)
Random blood glucose (mg/dL)	149 (106.5–183)
Fever (≥38.0 °C)	63 (32.3)
Tachycardia (>100/min)	95 (48.7)
Tachypnoea (≥22/min)	100 (51.3)
Hypoxaemia (SpO2 <92%)	37 (19.0)
Hypotension (SBP <90 mmHg)	12 (6.2)
qSOFA ≥2	110 (56.4)
Hypoglycaemia (<70 mg/dL)	14 (7.2)
Hyperglycaemia (≥200 mg/dL)	39 (20.0)
Neurological findings	
GCS, median (IQR)	9 (7–12.5)
GCS 13–14 (mild)	49 (25.1)
GCS 9–12 (moderate)	58 (29.7)
GCS 3–8 (severe)	88 (45.1)
Unequal pupils	15 (7.7)
Focal neurological deficit	27 (13.8)
Neck stiffness	4 (2.1)
Laboratory and imaging findings	
Anaemia	112 (57.4)
Leukocytosis (WBC >11 $\times 10^9$/L)	72 (36.9)
Hyponatraemia (Na <135 mmol/L)	37 (19.0)
Raised urea (>45 mg/dL)	84 (43.1)
Raised creatinine (>1.2 mg/dL)	92 (47.2)
Hyperbilirubinaemia (>1.2 mg/dL)	48 (24.6)
Acidaemia (pH <7.35)†	121 (85.8)
Hypercapnia (PaCO2 >45 mmHg)†	14 (9.9)
CT/MRI brain performed	84 (43.1)
Abnormal CT/MRI brain‡	26 (31.0)

†Among 141 patients with arterial blood gas analysis. ‡Among 84 patients imaged (acute ischaemic stroke 18, intracerebral haemorrhage 8). Anaemia: Hb <13 g/dL in men and <12 g/dL in women. qSOFA: quick Sequential Organ Failure Assessment.

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

Systemic infection/sepsis and metabolic/endocrine disorders were jointly the leading primary etiologies, each accounting for 55 (28.2%; 95% CI 22.4–34.9%) patients, followed by stroke (13.3%), seizure/post-ictal states (8.2%), toxicological causes (7.7%) and respiratory failure (7.2%). Urinary, abdominal and pulmonary sources contributed almost equally to sepsis. Within the metabolic group, hypoglycaemia (n=14) was the commonest cause, and diabetes-related emergencies (hypoglycaemia, diabetic ketoacidosis and hyperosmolar hyperglycaemic state) together accounted for 29 (14.9%) of all cases. Ischaemic stroke (n=18) outnumbered intracerebral haemorrhage (n=8), and organophosphate poisoning (n=8) was the commonest toxicological cause. The cause remained undetermined at ED disposition in 4 (2.1%) patients. (Table-III, Figure-1)

TABLE-III: Primary etiology and specific diagnoses of non-traumatic AMS (n=195)

Etiology / specific diagnosis	**n** (%)	**95% CI** (%)
Systemic infection/sepsis	**55 (28.2)**	22.4–34.9
Urinary source	19 (9.7)	
Abdominal source	18 (9.2)	
Pneumonia	18 (9.2)	
Metabolic/endocrine	**55 (28.2)**	22.4–34.9
Hypoglycaemia	14 (7.2)	
Uraemic encephalopathy	9 (4.6)	
Hyponatraemic encephalopathy	9 (4.6)	
Hepatic encephalopathy	8 (4.1)	
Diabetic ketoacidosis	8 (4.1)	
Hyperosmolar hyperglycaemic state	7 (3.6)	
Stroke	**26 (13.3)**	9.3–18.8
Acute ischaemic stroke	18 (9.2)	
Intracerebral haemorrhage	8 (4.1)	
Seizure/post-ictal	**16 (8.2)**	5.1–12.9
Toxicological	**15 (7.7)**	4.7–12.3
Organophosphate poisoning	8 (4.1)	
Opioid toxicity	5 (2.6)	
Benzodiazepine overdose	2 (1.0)	
Respiratory (hypercapnic) failure	**14 (7.2)**	4.3–11.7
CNS infection (encephalitis 3, meningitis 1)	**4 (2.1)**	0.8–5.2
Multifactorial	**3 (1.5)**	0.5–4.4
Cardiovascular	**2 (1.0)**	0.3–3.7
Psychiatric/functional	**1 (0.5)**	0.1–2.8
Undetermined at ED disposition	**4 (2.1)**	0.8–5.2

Percentages are of the total sample (n=195). CI: confidence interval (Wilson score method).

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

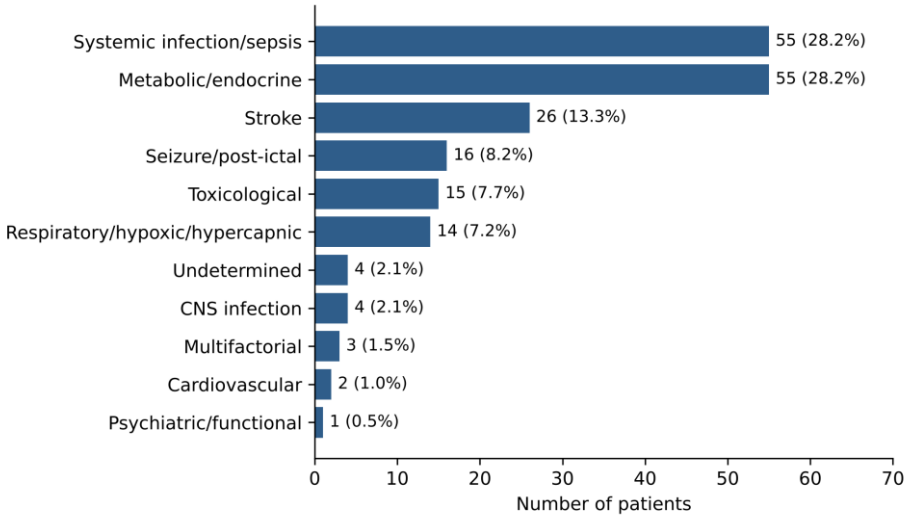


FIGURE-1: Distribution of primary etiological categories of non-traumatic AMS (n=195)

Values are number of patients (percentage of total).

After ED management, 61 (31.3%; 95% CI 25.2–38.1%) patients were admitted to wards, 54 (27.7%; 95% CI 21.9–34.4%) to HDU/ICU and 44 (22.6%) were transferred or referred, while 9 (4.6%) were discharged and 5 (2.6%) left against medical advice. Twenty-two patients (11.3%; 95% CI 7.6–16.5%) died in the ED, and the critical outcome occurred in 76 (39.0%). Among the 173 survivors, GCS improved from a median of 10 to 12 at disposition (Wilcoxon signed-rank $Z = -10.33$, $p < 0.001$). Patients with toxicological causes were younger (median 35 years; p=0.006), and ED disposition differed significantly across etiological groups ($p < 0.001$), with all discharges arising from the seizure, toxicological and other groups. ED mortality was highest in toxicological (26.7%) and seizure-related (18.8%) presentations, although the differences in ED death (p=0.292) and critical outcome (p=0.596) across etiologies were not significant. Initial GCS severity did not differ by etiology (p=0.965). (Table-IV)

TABLE-IV: ED disposition and outcomes according to primary etiological group, n (%)

Outcome	Sepsis (n=55)	Metab. (n=55)	Stroke (n=26)	Seizure (n=16)	Toxic (n=15)	Resp. (n=14)	Other * (n=14)	Total (n=195)	p-value
Discharged	0	0	0	5 (31.3)	3 (20.0)	0	1 (7.1)	9 (4.6)	<0.001 †
Ward	21 (38.2)	19 (34.5)	7 (26.9)	3 (18.8)	3 (20.0)	4 (28.6)	4 (28.6)	61 (31.3)	
HDU/ICU	15 (27.3)	20 (36.4)	8 (30.8)	1 (6.3)	1 (6.7)	6 (42.9)	3 (21.4)	54 (27.7)	
Transferred/referred	15 (27.3)	12 (21.8)	8 (30.8)	1 (6.3)	2 (13.3)	2 (14.3)	4 (28.6)	44 (22.6)	
Left against advice	0	0	0	3 (18.8)	2 (13.3)	0	0	5 (2.6)	
Died in ED	4 (7.3)	4 (7.3)	3 (11.5)	3 (18.8)	4 (26.7)	2 (14.3)	2 (14.3)	22 (11.3)	0.292†

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

Outcome	Sepsis (n=55)	Metab. (n=55)	Stroke (n=26)	Seizure (n=16)	Toxic (n=15)	Resp. (n=14)	Other * (n=14)	Total (n=195)	p-value
Critical outcome‡	19 (34.5)	24 (43.6)	11 (42.3)	4 (25.0)	5 (33.3)	8 (57.1)	5 (35.7)	76 (39.0)	0.596
Age (years), median	58	56	58.5	46.5	35	56	57	55	0.006§
GCS, median	9	10	10	10	8	9.5	9	9	0.862§

**CNS infection (4), undetermined (4), multifactorial (3), cardiovascular (2), psychiatric/functional (1). †Fisher–Freeman–Halton exact test (Monte Carlo). ‡HDU/ICU admission or death in ED; chi-square test. §Kruskal–Wallis test. Metab.: metabolic/endocrine; Resp.: respiratory failure.*

All 22 ED deaths occurred in patients with GCS 3–8 (25.0% mortality in this group versus none with GCS ≥9; p <0.001), and the critical outcome was more frequent with severe than with moderate or mild impairment (53.4% vs 25.9% vs 28.6%; p=0.001). On univariable analysis, patients who died had a lower initial GCS (median 6.5 vs 10; p <0.001), higher random glucose (median 176.5 vs 143 mg/dL; p=0.023) and more frequent anaemia (77.3% vs 54.9%; p=0.046). On multivariable analysis, a higher initial GCS was independently associated with lower odds of ED death and anaemia with higher odds, whereas glucose was not significant. For the critical outcome, lower GCS, hypotension and lower white cell count were independent predictors. (Table-V) The initial GCS discriminated ED death with an area under the curve (AUC) of 0.795 (95% CI 0.726–0.863; p <0.001); a cut-off of GCS ≤8 identified all deaths (sensitivity 100%, specificity 61.8%, negative predictive value 100%). Discrimination for the critical outcome was poor (AUC 0.635). (Figure-2)

TABLE-V: Binary logistic regression for factors associated with ED death and critical outcome (n=195)

Variable	Crude OR (95% CI)	p-value	Adjusted OR (95% CI)	p-value
Death in ED (22 events)				
Initial GCS (per 1-point increase)	0.64 (0.51–0.80)	<0.001	0.62 (0.49–0.78)	<0.001
Random blood glucose (per 50 mg/dL)	1.02 (0.88–1.19)	0.780	0.98 (0.84–1.15)	0.811
Anaemia (yes vs no)	2.79 (0.99–7.91)	0.053	3.33 (1.10–10.10)	0.034
Critical outcome: HDU/ICU admission or ED death (76 events)				
Initial GCS (per 1-point increase)	0.86 (0.78–0.94)	0.001	0.84 (0.76–0.93)	0.001
Male gender (vs female)	1.87 (1.04–3.35)	0.035	1.87 (1.00–3.48)	0.050
WBC count (per 1 $\times 10^9$/L)	0.95 (0.90–1.01)	0.080	0.92 (0.86–0.98)	0.012
Hypotension, SBP <90 mmHg (yes vs no)	3.38 (0.98–11.65)	0.054	5.76 (1.40–23.76)	0.015
Serum sodium (per 1 mmol/L)	1.04 (0.99–1.09)	0.091	1.04 (0.99–1.10)	0.098

Model for ED death: Nagelkerke R^2 0.281, Hosmer–Lemeshow χ^2 5.39, p=0.715, overall accuracy 88.7%. Model for critical outcome: Nagelkerke R^2 0.185, Hosmer–Lemeshow χ^2 15.43, p=0.051, overall accuracy 70.8%. OR: odds ratio; CI: confidence interval.

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

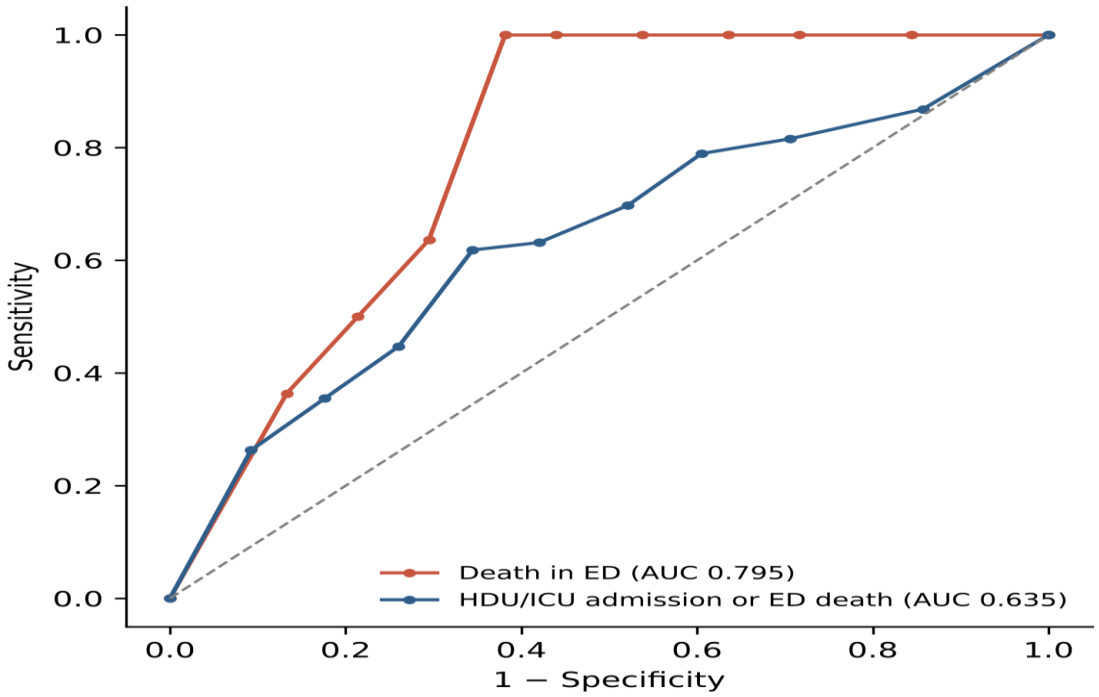


FIGURE-2: ROC curves of initial Glasgow Coma Scale for death in the ED and for critical outcome
Lower GCS treated as the positive test direction. AUC: area under the curve.

DISCUSSION

Altered mental status is a common and high-risk presentation in EDs worldwide, and its etiological spectrum depends on the population served and the resources available.[1,2] In this study, systemic infection/sepsis and metabolic/endocrine disorders were the leading causes, each accounting for 28.2% of patients, followed by stroke (13.3%). This distribution closely mirrors the Korean experience, where systemic infection (28.6%), metabolic causes (22.4%) and stroke (13.4%) predominated,[4] and the multicentre Korean cohort in which metabolic causes were most frequent.[5] Locally, Khan et al. also reported sepsis as the leading cause (33.3%) in Karachi, with metabolic encephalopathy and diabetic complications together accounting for about a quarter of cases,[10] which is in line with our findings. In contrast, studies from Rawalpindi, India and Nepal reported cerebrovascular causes as the commonest,[8,9,11] whereas drug abuse was a major cause in Saudi Arabia.[7] These differences probably reflect variations in case definitions, referral patterns, the age of the population and the inclusion of trauma or psychiatric presentations.

Metabolic causes were as frequent as sepsis in our cohort, and diabetes-related emergencies alone accounted for 14.9% of all cases. Diabetes was present in 61.8% of the metabolic group compared with 21–31% of the other groups. Pakistan now has one of the highest prevalences of adult diabetes in the world,[15] and hypoglycaemia, diabetic ketoacidosis and hyperosmolar states are therefore expected to remain important, and rapidly reversible, causes of AMS. Uraemic, hyponatraemic and hepatic encephalopathy made up most of the remaining metabolic cases, which emphasizes the value of early bedside glucose, electrolytes and renal and liver function tests in every patient with AMS.

Sepsis was a leading cause and was associated with fever in 78.2% of cases, with urinary, abdominal and pulmonary sources contributing almost equally. Sepsis-associated encephalopathy occurs in more than half of septic patients and is independently associated with mortality, particularly when the GCS is 8 or below.[16] More than half of our patients were qSOFA-positive, and a local study showed significantly higher mortality in septic patients with a qSOFA score above two.[17] However, qSOFA was not associated with ED death in our

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

cohort, probably because altered mentation, one of its three components, was present in every patient. Early recognition of infection as the cause of AMS remains important, since timely antimicrobials and resuscitation are central to sepsis management.[14]

Stroke accounted for 13.3% of cases, and all abnormal neuroimaging findings were due to stroke. Neuroimaging was performed in 43.1% of patients and was abnormal in 31.0% of them, and every stroke patient had a focal neurological deficit. A recent meta-analysis did not find delirium, confusion or AMS alone to be a significant predictor of abnormal head CT in older ED patients,[18] which supports a selective approach to imaging guided by focal signs in resource-limited EDs. Toxicological causes affected markedly younger patients (median 35 years), and organophosphate compounds were the commonest agents. Muhammad et al. similarly reported that organophosphate poisoning in Sindh mainly affects young people, usually with intentional ingestion.[19] Although the toxicological group had the highest ED mortality (26.7%), the difference across etiologies was not significant.

A notable finding was the delay in presentation: half the patients arrived more than 72 hours after onset and only 2.6% within six hours, and 45.1% had a GCS of 3–8 on arrival. Early presentation has been associated with a better prognosis in AMS,[8] and such delays may reflect a lack of awareness, referral from peripheral facilities and limited prehospital services. ED mortality in our study (11.3%) was higher than the 4.6–6.1% reported from Korean EDs[2,4] and the 2.7% reported from Tanzania,[12] and only 4.6% of our patients were discharged compared with 38% in the United States.[1] These differences are likely explained by the greater severity at arrival in a public tertiary referral centre. Moreover, 22.6% of patients were transferred or referred, which likely reflects bed and critical-care capacity constraints; a tertiary care ED in Pakistan was found to be extremely overcrowded during almost all observed periods.[20]

The initial GCS was the strongest predictor of outcome. All deaths occurred in patients with GCS ≤8, each one-point increase in GCS reduced the odds of ED death by 38%, and the GCS showed acceptable discrimination for ED death (AUC 0.795) with a 100% negative predictive value at a cut-off of ≤8. This is consistent with studies from Pakistan, Nepal, India and Cameroon, in which a low GCS was associated with mortality in patients with AMS or non-traumatic coma,[8,11,13,21] and with the strong association of GCS 3–8 with death in sepsis-associated encephalopathy.[16] In contrast, etiology itself was not significantly associated with ED death or critical outcome, suggesting that the severity of brain dysfunction at presentation, rather than its cause, drives early mortality. This interpretation agrees with Kim et al., who suggested that disease severity rather than etiology determines outcome in altered consciousness.[4]

Anaemia was present in 57.4% of patients and was independently associated with ED death. Low haemoglobin has been associated with higher mortality in septic patients,[22] and anaemia may reduce cerebral oxygen delivery and reflect chronic illness and malnutrition. Hypotension was the strongest independent predictor of the critical outcome, consistent with the reported association of low blood pressure and poor oxygenation with mortality in AMS.[11]

The inverse association between white cell count and the critical outcome should be interpreted with caution, as leukocytosis was concentrated in septic patients, who had a lower critical outcome rate than several other groups. Batool et al. also reported male gender, mean blood pressure, GCS and oxygen saturation as factors associated with mortality.[11]

This study has some limitations. It was conducted at a single centre using non-probability sampling, which may limit generalizability. Outcomes were recorded only up to ED disposition, so in-hospital mortality and the outcomes of transferred patients could not be determined. The etiology was assigned at ED disposition and may have changed after further evaluation, and investigations such as arterial blood gases and neuroimaging were performed only when clinically indicated. The small number of deaths limited the number of variables in the regression model, and severity scores such as SOFA were not calculated. Multicentre studies with follow-up to hospital discharge are recommended.

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

CONCLUSION

Sepsis and metabolic derangements, particularly diabetes-related emergencies, were the leading causes of non-traumatic AMS at our centre, followed by stroke. Most patients presented late with severe impairment of consciousness, and an initial GCS ≤8 identified all patients who died in the ED.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

SOURCE OF FUNDING

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

REFERENCES

Pertsovskaya V, Zhang C, Choi JJ, Lappin R, Kamel H, Navi BB, et al. Characteristics of U.S. emergency department visits for altered mental status, 2016-2022. Am J Emerg Med. 2026; 99:445-50. DOI: 10.1016/j.ajem.2025.10.063

Kim KT, Seo JG, Park JA, Kwon DH. Altered level of consciousness in the emergency department before and after coronavirus disease-19: A four-year multicenter study. Neurology Asia. 2026; 31(1):151-9. DOI: 10.54029/2026wys

Rosenkvist AR, Engstrøm CN, Kindberg IB, Engstrup TM, Christensen EF, Bøggild H, et al. Ambulance patients with altered level of consciousness: A registry-based cohort study from the North Denmark Region in 2017–2021. Scand J Trauma Resusc Emerg Med. 2026; 34(1):40. DOI: 10.1186/s13049-026-01562-z

Kim KT, Jeon JC, Jung CG, Park JA, Seo JG, Kwon DH. Etiologies of altered level of consciousness in the emergency room. Sci Rep. 2022; 12(1):4972. DOI: 10.1038/s41598-022-09110-2

Kim KT, Kwon DH, Jeon JC, Kim IC, Park JA, Seo JG. A multicenter study of altered level of consciousness in the emergency room. Intern Emerg Med. 2022; 17(8):2329-37. DOI: 10.1007/s11739-022-03104-8

Moussa BS, Abd Elatiff ZM, Kamal Eldin Elhadary GM. Survey study of the etiology of non-traumatic altered consciousness in the emergency department at Suez Canal University Hospital in Egypt. World J Clin Cases. 2023; 11(6):1310-7. DOI: 10.12998/wjcc.v11.i6.1310

Al Aseri ZA, Alotaibi OM, Albarrak IMA, Aljaghwani SAS, Alkhars AMA, Althubaiti MM, et al. Clinical characteristics, aetiologies, and disposition outcomes of patients presenting with altered mental status in an academic emergency department. Neurosciences (Riyadh). 2026; 31(1):67-74. DOI: 10.17712/1658-3183.1009

Sudhir, Avinash HR, Yashawant NS. Study of etiology, clinical profile, and outcome of altered sensorium patients admitted in a tertiary care hospital. Asian J Med Sci. 2024; 15(10):93-9. DOI: 10.3126/ajms.v15i10.67118

Gaira M, Darlami BL, Chettri S, Pandey UK, Koirala D. Study of clinical profile in nontraumatic adult patients with altered sensorium and its correlation with the outcome at emergency room of a tertiary care hospital, Devdaha, Rupandehi. Med J East Nepal. 2026; 5(1):21-7. DOI: 10.3126/mjen.v5i01.96384

Khan JA, Mehmood H, Khattak MI. Altered mental status and its causes: Commonest dilemma of residents and emergency physicians. Pak Armed Forces Med J. 2022; 72(5):1770-3. DOI: 10.51253/pafmj.v72i5.7337

Batool SN, Zareen SF, Batool SK, Liaqat F, Munir Z, Abbas SW. Prognostic factor of outcome in adults with altered mental status presenting in emergency department. Pak Armed Forces Med J. 2023; 73(4):1208-11. DOI: 10.51253/pafmj.v73i4.7338

Frontier in Medical & Health Research

ISSN: (e) 3007-1607 (p) 3007-1593

Manji HK, Sawe HR, Kilindimo S, Premji EN, Yussuf AO, Simbila AN, et al. Clinical profile and mortality among adult patients presenting with altered mental status to the emergency departments of a tertiary hospital in Tanzania: A descriptive cohort study. Pan Afr Med J. 2022; 41:46. DOI: 10.11604/pamj.2022.41.46.31601

Gams Massi D, Kedonkwo Mbogne AH, Siysi VV, Metogo Mbengono JA, Magnerou AM, Bila Lamou EG, et al. Outcome of non-traumatic coma in a tertiary referral hospital in Cameroon. Afr J Emerg Med. 2024; 14(3):179-85. DOI: 10.1016/j.afjem.2024.06.003

Evans L, Rhodes A, Alhazzani W, Antonelli M, Coopersmith CM, French C, et al. Surviving sepsis campaign: International guidelines for management of sepsis and septic shock 2021. Crit Care Med. 2021; 49(11):e1063-143. DOI: 10.1097/CCM.0000000000005337

International Diabetes Federation. IDF Diabetes Atlas [Internet]. 11th ed. Brussels: International Diabetes Federation; 2025 [cited 2026 Nov 2]. Available from: https://diabetesatlas.org

Sonneville R, Benghanem S, Jeantin L, de Montmollin E, Doman M, Gaudemer A, et al. The spectrum of sepsis-associated encephalopathy: A clinical perspective. Crit Care. 2023; 27(1):386. DOI: 10.1186/s13054-023-04655-8

Waqar Khan RM, Mahmood A, Qayyum M, Younas Z. Increase mortality rate in sepsis patients with qSOFA score greater than two. Pak Armed Forces Med J. 2022; 72(6):2174-7. DOI: 10.51253/pafmj.v72i6.9072

Lee S, Cavalier FR, Hayes JM, Doering M, Lo AX, Khoujah D, et al. Delirium, confusion, or altered mental status as a risk for abnormal head CT in older adults in the emergency department: A systematic review and meta-analysis. Am J Emerg Med. 2023; 71:190-4. DOI: 10.1016/j.ajem.2023.06.034

Muhammad S, Almani KF, Mughal UR, Khaskheli MS, Tabassum R, Ahmad R, et al. A prospective cohort study on factors of mortality due to acute organophosphate poisoning. J Liaquat Uni Med Health Sci. 2025; 24(3):286-94. DOI: 10.22442/jlumhs.2025.01230

Zafar Z, Ashraf N, Alamgir W, Rehman A, Ain QU, Ilyas S. Comparison of the International Crowding Measure in Emergency Departments (ICMED) and the National Emergency Department Overcrowding Study (NEDOCS) in tertiary care hospital to measure emergency department crowding. Pak Armed Forces Med J. 2023; 73(1):3-7. DOI: 10.51253/pafmj.v73i1.8202

Kafle DR, Sah RP, Karki DR. Non traumatic coma in the intensive care unit: Etiology and prognosis. Kathmandu Univ Med J. 2021; 19(3):371-4. DOI: 10.3126/kumj.v19i3.49719

Chen Y, Chen L, Meng Z, Li Y, Tang J, Liu S, et al. The correlation of hemoglobin and 28-day mortality in septic patients: Secondary data mining using the MIMIC-IV database. BMC Infect Dis. 2023; 23(1):417. DOI: 10.1186/s12879-023-08384-9