Section: Emergency Medicine

Original Research Article

STUDY OF CLINICAL PROFILE AND MORTALITY AMONG ADULT PATIENTS PRESENTING WITH ALTERED MENTAL STATUS TO EMERGENCY DEPARTMENT

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ABSTRACT

Background: Altered mental status (AMS) is a common and potentially life-threatening emergency department presentation resulting from diverse neurological, metabolic, infectious, toxicological, and systemic disorders. Early identification of the underlying etiology and prognostic factors is essential for improving patient outcomes. **Objectives:** To evaluate the clinical profile, etiological spectrum, and short-term outcomes of adult patients presenting with non-traumatic AMS and to identify predictors of early mortality.

Materials and Methods: This prospective observational study was conducted in the Emergency Department of Santosh Medical College and Hospital, Ghaziabad, North India. A total of 129 adult patients (≥18 years) presenting with non-traumatic AMS were enrolled. Demographic characteristics, clinical findings, laboratory investigations, neuroimaging results, etiological diagnoses, and outcomes were recorded. Mortality was assessed on Day 0 and Day 7. Multivariate logistic regression analysis was performed to identify independent predictors of 7-day mortality.

Results: The mean age of the study population was 53.13 ± 16.83 years, and 63.6% were males. Confusion (38.8%) was the most common presenting complaint. Ischemic stroke (17.8%) was the leading etiology, followed by sepsis (12.4%), seizure-related causes (10.9%), and uremic encephalopathy (10.9%). Day 0 mortality was 8.5%, while 7-day mortality was 20.9%. Patients who died within 7 days had significantly lower Glasgow Coma Scale (GCS) scores, lower oxygen saturation, higher serum lactate levels, higher serum creatinine levels, lower arterial pH, and more frequent abnormal CT head findings ($p<0.05$ for all). Multivariate logistic regression identified lower GCS score (Adjusted OR=1.38, $p<0.001$), elevated serum lactate (Adjusted OR=1.62, $p=0.002$), abnormal CT head findings (Adjusted OR=4.91, $p=0.005$), metabolic acidosis (Adjusted OR=3.27, $p=0.010$), and neurological etiology (Adjusted OR=2.89, $p=0.030$) as independent predictors of 7-day mortality.

Conclusion: AMS is associated with substantial early mortality and is most commonly caused by neurological, metabolic, and infectious disorders. Lower GCS score, elevated lactate, metabolic acidosis, abnormal neuroimaging findings, and neurological etiology are significant predictors of short-term mortality. Early recognition and aggressive management of high-risk patients may improve clinical outcomes.

Keywords: Altered mental status, altered status, emergency department, Glasgow Coma Scale, stroke, sepsis, mortality, neuroimaging, lactate, prognostic factors.

INTRODUCTION

Altered Mental Status (AMS) is a common and diagnostically challenging emergency presentation characterized by disturbances in consciousness, cognition, attention, awareness, or behaviour resulting from impaired cerebral function.[1] Rather than a specific disease entity, AMS represents a clinical syndrome encompassing a spectrum ranging from confusion and delirium to stupor and coma. Because numerous neurological, metabolic, infectious, toxicological, and systemic disorders can affect brain function, AMS often reflects serious underlying pathology requiring urgent evaluation and intervention.[2]

AMS accounts for approximately 4–10% of adult emergency department visits worldwide and is particularly common among elderly individuals due to age-related physiological changes, multiple comorbidities, polypharmacy, and baseline cognitive impairment.[3,4] In the Indian setting, metabolic disturbances, infections, and cerebrovascular diseases have been reported as the most frequent causes of altered status.[5,6] The inability of many patients to provide an accurate history further complicates diagnosis, making rapid clinical assessment and early investigations essential for identifying reversible causes such as hypoglycemia, electrolyte abnormalities, sepsis, and stroke.[7,8]

The etiological spectrum of AMS is broad and includes metabolic encephalopathies, cerebrovascular accidents, seizures, intracranial hemorrhage, central nervous system infections, poisoning, drug intoxication, and systemic organ dysfunction.[9] Previous Indian studies have identified cerebrovascular disease as a leading cause of AMS, followed by metabolic and infectious etiologies.[10,11] However, considerable variation exists across studies regarding patient characteristics, diagnostic criteria, and outcome measures, limiting the development of standardized risk stratification approaches.[12,13] Early prognostication remains crucial because AMS is associated with substantial morbidity and mortality. Factors such as advanced age, low Glasgow Coma Scale (GCS) score, hypotension, hypoxia, metabolic acidosis, systemic infection, and multiorgan dysfunction have been associated with poor outcomes and increased mortality.[11,14] Nevertheless, data on very early mortality, particularly within the first 24 hours and first week of presentation, remain limited in Indian emergency care settings.

Therefore, the present prospective observational study was conducted at Santosh Medical College and Hospital, Ghaziabad, to evaluate the demographic profile, clinical characteristics, etiological spectrum, laboratory and radiological findings, and short-term outcomes of adult patients presenting with non-traumatic AMS.

MATERIALS AND METHODS

This hospital-based prospective observational study was conducted to evaluate the clinical profile, etiological spectrum, and short-term outcomes of adult patients presenting with altered mental status (AMS) in the emergency department. The study was conducted in the Department of Medicine at Santosh Medical College and Hospital, Ghaziabad, a tertiary care teaching hospital in Northern India.

Study Population

The study population comprised adult patients presenting to the Emergency Department with acute altered mental status. AMS was defined as an acute disturbance in consciousness, cognition, awareness, attention, perception, or behaviour that was not attributable to a previously diagnosed neurological or psychiatric disorder.

Inclusion Criteria

Patients were included in the study if they fulfilled the following criteria:

1. Age ≥18 years.
2. Presence of acute altered mental status as determined by clinical assessment.
3. Glasgow Coma Scale (GCS) score less than 15 or clinically evident alteration in status.
4. Written informed consent obtained from the patient or a legally authorized representative.

Exclusion Criteria

Patients were excluded from the study if they met any of the following criteria:

1. Age less than 18 years.
2. Previously diagnosed chronic neurological disorders causing persistent altered consciousness.
3. Previously diagnosed psychiatric illnesses associated with altered mental status.
4. Traumatic brain injury or trauma-related altered status.
5. Cardiac arrest prior to emergency department evaluation.
6. Refusal of consent by the patient or legally authorized representative.

Data Collection Procedure

Data were collected prospectively using a standardized case record form. Upon presentation to the Emergency Department, each patient underwent a detailed clinical evaluation that included history taking, physical examination, and assessment of consciousness using the Glasgow Coma Scale (GCS). Vital parameters including blood pressure, pulse rate, respiratory rate, body temperature, oxygen saturation, and capillary blood glucose were recorded immediately at admission. A comprehensive neurological examination and systemic examination were subsequently performed by the attending physician. Laboratory investigations including complete blood count, serum electrolytes, renal function tests, liver function tests, arterial blood gas analysis, and other relevant investigations were

ordered according to clinical indications. Neuroimaging studies such as computed tomography (CT) or magnetic resonance imaging (MRI) of the brain were performed whenever clinically warranted. Patients were followed throughout their hospital stay, and outcomes were assessed at two predefined time points: within 24 hours of presentation (Day 0) and on the seventh day after admission (Day 7). Additional clinical information was obtained from medical records and caregivers whenever necessary.

Study Variables

Independent Variables

- Age
- Gender
- Occupation
- Glasgow Coma Scale score
- Presenting symptoms
- Vital signs at admission
- Laboratory parameters (blood glucose, electrolytes, renal function tests, liver function tests, arterial blood gas findings)
- Radiological findings (CT/MRI)
- Etiological classification of AMS

Dependent Variables

Primary Outcomes

- Mortality within 24 hours of presentation (Day 0 mortality)
- Mortality within 7 days of admission (Day 7 mortality)

Secondary Outcomes

- Etiological diagnosis of AMS
- Length of hospital stay
- Final diagnosis
- Discharge status

Operational Definitions

Altered Mental Status (AMS)

AMS was defined as an acute disturbance in consciousness, cognition, attention, awareness, perception, or behaviour resulting in impaired cerebral functioning.

Glasgow Coma Scale Classification

- Mild impairment: GCS score 13–15
- Moderate impairment: GCS score 9–12
- Severe impairment: GCS score ≤8

Outcome Measures

The primary outcome measures included:

1. Day 0 mortality, defined as death occurring within 24 hours of presentation to the Emergency Department.
2. Day 7 mortality, defined as death occurring within seven days of hospital admission.

Secondary outcome measures included:

1. Etiological diagnosis of AMS.
2. Duration of hospital stay.
3. Discharge status categorized as recovered, referred, or expired.

Statistical Analysis

Data were entered into Microsoft Excel and subsequently analyzed using Statistical Package for the Social Sciences (SPSS) software version 22.0. Descriptive statistics were used to summarize demographic, clinical, laboratory, and radiological characteristics of the study population. Continuous variables were expressed as mean ± standard deviation or median with interquartile range, as appropriate. Categorical variables were presented as frequencies and percentages.

Associations between categorical variables were analyzed using the Chi-square test or Fisher's exact test whenever appropriate. Continuous variables were compared using the independent Student's t-test or Mann–Whitney U test based on the distribution of data. Multivariate logistic regression analysis was performed to identify independent predictors of mortality. A p-value less than 0.05 was considered statistically significant

RESULTS

A total of 129 patients presenting with altered mental status were included in the study. The mean age of the study participants was 53.13 ± 16.83 years, with a median age of 55 years. Males constituted 82 (63.6%) patients, while females accounted for 47 (36.4%). The mean duration of symptoms before presentation was 19.02 ± 24.43 hours. Hypertension was the most common comorbidity, observed in 49 (38.0%) patients, followed by diabetes mellitus in 35 (27.1%), chronic liver disease in 19 (14.7%), chronic kidney disease in 14 (10.9%), and alcohol use in 27 (20.9%) patients. The mean GCS score at presentation was 9.91 ± 3.85, while the mean SpO_2 was 92.68 ± 5.48%. Other baseline physiological parameters are summarized in Table 1A and illustrated in Figure 1A. The most common chief complaint was confusion, reported in 50 (38.8%) patients, followed by unconsciousness in 23 (17.8%), abnormal behaviour in 19 (14.7%), seizures in 17 (13.2%), syncope in 16 (12.4%), and agitation in 4 (3.1%) patients. The distribution of chief complaints is shown in Table 1B and illustrated in Figure 1B.

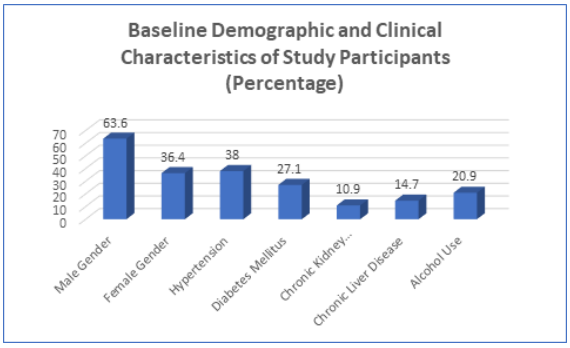
Laboratory evaluation showed a mean random blood sugar level of 139.15 ± 93.21 mg/dL, total leukocyte count of 12.45 ± 7.23 ×10³/µL, serum sodium of 136.90 ± 6.59 mmol/L, serum potassium of 4.06 ± 0.69 mmol/L, serum creatinine of 2.38 ± 2.55 mg/dL, ABG pH of 7.38 ± 0.11, and serum lactate of 2.39 ± 1.63 mmol/L. CT head was abnormal in 62 (48.1%) patients, EEG abnormality was observed in 27 (20.9%), and toxicology screening was positive in 11 (8.5%) patients. Ischemic stroke was the most common etiology, identified in 23 (17.8%) patients, followed by sepsis in 16 (12.4%), seizure-related causes and uremic encephalopathy in 14 (10.9%) patients each. These laboratory, imaging, and etiological findings are presented in Table 2. On comparison according to 7-day mortality status, patients who died within 7 days had significantly longer symptom duration, lower GCS score, lower SpO_2 , higher serum lactate, higher serum creatinine, and lower ABG pH compared with survivors.

Abnormal CT head findings, EEG abnormalities, and neurological etiology were also significantly more frequent among patients who died within 7 days. These findings are shown in Table 3.

Multivariate logistic regression analysis identified lower GCS score, elevated serum lactate, abnormal CT head findings, acidosis on ABG pH, and neurological etiology as independent predictors of 7-day mortality. Among these, abnormal CT head findings showed the highest adjusted odds ratio for mortality. The regression findings are presented in Table 4 and illustrated in Figure 4.

Table 1A: Baseline Demographic and Clinical Characteristics of Study Participants (N = 129)

Variable	Value
Age (years), Mean ± SD	53.13 ± 16.83
Median Age (IQR)	55 (41–65)
Male Gender, n (%)	82 (63.6)
Female Gender, n (%)	47 (36.4)
Duration of Symptoms (hours), Mean ± SD	19.02 ± 24.43
Hypertension, n (%)	49 (38.0)
Diabetes Mellitus, n (%)	35 (27.1)
Chronic Kidney Disease, n (%)	14 (10.9)
Chronic Liver Disease, n (%)	19 (14.7)
Alcohol Use, n (%)	27 (20.9)
GCS Score, Mean ± SD	9.91 ± 3.85
SpO_2 (%), Mean ± SD	92.68 ± 5.48
Respiratory Rate (breaths/min), Mean ± SD	17.40 ± 5.33
Pulse Rate (beats/min), Mean ± SD	88.51 ± 20.41
Systolic BP (mmHg), Mean ± SD	134.44 ± 27.91
Diastolic BP (mmHg), Mean ± SD	79.13 ± 15.45



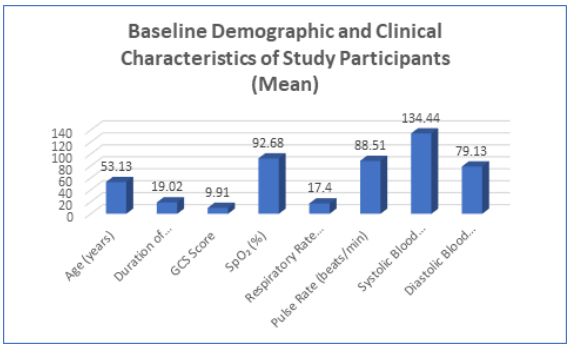


Figure 1A: Baseline Demographic and Clinical Characteristics of Study Participants

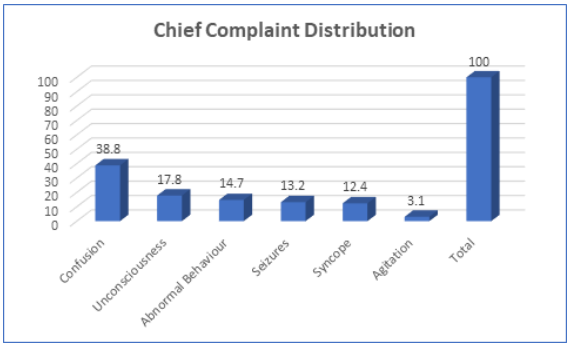


Figure 1B: Chief Complaint Distribution

B. Chief Complaint Distribution

Complaint	n (%)
Confusion	50 (38.8)
Unconsciousness	23 (17.8)
Abnormal Behaviour	19 (14.7)
Seizures	17 (13.2)
Syncope	16 (12.4)
Agitation	4 (3.1)

Table 2: Laboratory, Imaging Findings and Etiological Distribution (N = 129)

A. Laboratory Parameters

Variable	Mean ± SD
Random Blood Sugar (mg/dL)	139.15 ± 93.21
Total Leukocyte Count (×10³/µL)	12.45 ± 7.23

Serum Sodium (mmol/L)	136.90 ± 6.59
Serum Potassium (mmol/L)	4.06 ± 0.69
Serum Creatinine (mg/dL)	2.38 ± 2.55
ABG pH	7.38 ± 0.11
Serum Lactate (mmol/L)	2.39 ± 1.63

B. Imaging and Ancillary Investigations

Finding	n (%)
Abnormal CT Head	62 (48.1)
Normal CT Head	67 (51.9)
EEG Abnormality	27 (20.9)
Positive Toxicology Screen	11 (8.5)

C. Etiological Distribution

Etiology	n (%)
Ischemic Stroke	23 (17.8)
Sepsis	16 (12.4)
Seizure-related	14 (10.9)
Uremic Encephalopathy	14 (10.9)
Toxicity/Poisoning	11 (8.5)
Hepatic Encephalopathy	10 (7.8)
Hemorrhagic Stroke	8 (6.2)
Meningitis/Encephalitis	7 (5.4)
Hypoglycemia	7 (5.4)
Other/Unknown Causes	19 (14.7)

Table 3: Comparison of Clinical and Imaging Parameters According to Mortality Status

Variable	Survived Day 7 (n=102)	Died ≤7 Days (n=27)	p-value
Age (years)	52.7 ± 16.5	54.9 ± 17.8	0.69
Duration of Symptoms (hours)	17.1 ± 22.9	26.8 ± 27.1	0.04*
GCS Score	10.8 ± 3.5	6.6 ± 3.4	<0.001*
SpO_2 (%)	93.4 ± 5.1	89.7 ± 6.2	0.01*
Serum Lactate (mmol/L)	2.0 ± 1.3	4.0 ± 2.2	<0.001*
Serum Creatinine (mg/dL)	2.1 ± 2.2	3.4 ± 3.1	0.03*
ABG pH	7.39 ± 0.10	7.28 ± 0.14	0.002*
Abnormal CT Head, n (%)	40 (39.2)	22 (81.5)	<0.001*
EEG Abnormality, n (%)	17 (16.7)	10 (37.0)	0.02*
Neurological Etiology, n (%)	35 (34.3)	18 (66.7)	0.003*

Statistically Significant

Table 4: Multivariate Logistic Regression Analysis for Independent Predictors of 7-Day Mortality (N = 129)

Variable	Adjusted OR	95% CI	p-value
GCS (per unit decrease)	1.38	1.18–1.63	<0.001*
Lactate (mmol/L)	1.62	1.21–2.18	0.002*
Abnormal CT Head	4.91	1.62–14.90	0.005*
ABG pH (Acidosis)	3.27	1.24–8.59	0.010*
Neurological Etiology	2.89	1.09–7.64	0.030*

Statistically Significant

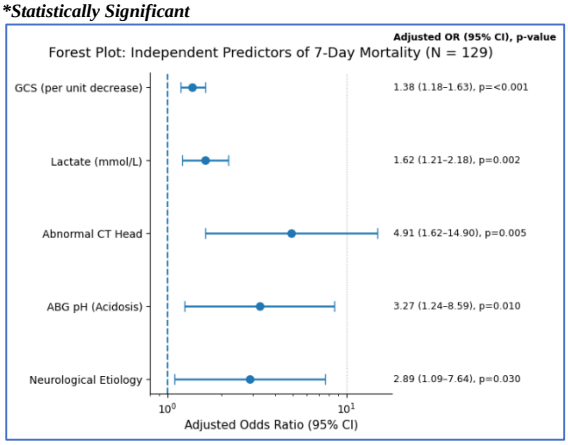


Figure 4: Multivariate Logistic Regression Analysis for Independent Predictors of 7-Day Mortality (N = 129)

DISCUSSION

Altered mental status (AMS) is a common neurological emergency resulting from diverse neurological, metabolic, infectious, toxicological, and systemic disorders. In the present prospective observational study of 129 adults presenting with non-traumatic AMS, substantial early mortality was observed, with 8.5% of patients dying within 24 hours and 20.9% within 7 days, highlighting the serious nature of this clinical syndrome. The mean age of patients was 53.13 ± 16.83 years, with a male predominance (63.6%). Similar observations have been reported by Wani et al,[10] and Ahmad et al,[14] who found that AMS occurs predominantly among older adults and males due to a higher burden of comorbid illnesses and vascular risk factors. Advancing age remains an important determinant of

both AMS occurrence and adverse outcomes. Confusion (38.8%) was the most common presenting complaint, followed by unconsciousness (17.8%), abnormal behaviour (14.7%), seizures (13.2%), and syncope (12.4%), findings comparable to those reported by Wani et al,[10] who identified altered consciousness and confusion as the predominant manifestations of AMS. Hypertension (38.0%) and diabetes mellitus (27.1%) were the most frequent comorbidities, consistent with observations by Ahmad et al,[14] reflecting the growing burden of chronic non-communicable diseases that predispose patients to cerebrovascular and metabolic causes of AMS. Regarding etiology, ischemic stroke (17.8%) emerged as the leading cause, followed by sepsis (12.4%), seizure-related disorders (10.9%), and uremic encephalopathy (10.9%). Broadly, neurological disorders constituted the largest etiological category. Similar findings have been documented by Wani et al,[10] and other Indian studies, which identified cerebrovascular disease as the predominant cause of AMS in emergency settings. Infectious and metabolic encephalopathies also contributed significantly to the disease burden. The mean Glasgow Coma Scale (GCS) score at presentation was 9.91 ± 3.85. Patients who died had significantly lower GCS scores than survivors (6.6 ± 3.4 vs. 10.8 ± 3.5; $p<0.001$). Multivariate analysis demonstrated that each unit decrease in GCS increased mortality risk by 1.38 times, supporting previous findings by Ahmad et al,[14] that low GCS is one of the strongest predictors of adverse outcomes in AMS. Laboratory abnormalities were strongly associated with mortality. Non-survivors had significantly higher lactate levels, elevated creatinine, and lower arterial pH values. Elevated lactate independently predicted mortality (adjusted OR 1.62; $p=0.002$), while metabolic acidosis increased mortality risk more than threefold (adjusted OR 3.27; $p=0.010$). These findings are consistent with previous reports demonstrating that hyperlactatemia and acidosis reflect severe physiological stress, tissue hypoperfusion, and poor prognosis in critically ill patients.[14] Neuroimaging also played an important prognostic role. Abnormal CT head findings were observed in 48.1% of patients and were significantly more frequent among non-survivors (81.5% vs. 39.2%; $p<0.001$). Abnormal CT findings independently increased mortality risk nearly fivefold (adjusted OR 4.91; $p=0.005$), corroborating findings from Wani et al,[10] who reported poorer outcomes among patients with structural intracranial lesions. Multivariate analysis identified five independent predictors of 7-day mortality: low GCS score, elevated serum lactate, metabolic acidosis, abnormal CT head findings, and neurological etiology. Neurological causes nearly tripled the risk of mortality (adjusted OR 2.89; $p=0.030$). These findings emphasize that AMS is often a marker of severe underlying disease and highlight the importance of early risk stratification.

CONCLUSION

Altered mental status is a common emergency presentation associated with substantial early mortality, with 8.5% of patients dying within 24 hours and 20.9% within 7 days of presentation. Neurological disorders, particularly stroke, followed by metabolic and infectious etiologies, were the most frequent causes of AMS. Lower Glasgow Coma Scale scores, elevated serum lactate levels, metabolic acidosis, abnormal CT head findings, and neurological etiology were identified as independent predictors of 7-day mortality. Early recognition, rapid diagnostic evaluation, and prompt management of high-risk patients may improve outcomes and reduce mortality in patients presenting with altered mental status

Limitations

This study was conducted at a single tertiary care center with a relatively small sample size. The follow-up period was restricted to 7 days; therefore, long-term neurological and functional outcomes could not be assessed. Additionally, some etiological categories may have been underrepresented due to limitations in advanced diagnostic investigations and variations in referral patterns.

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