

# A Clinical Profile of Non-traumatic Patients with Altered Mental Status Presenting to the Emergency Department

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## ABSTRACT

**Introduction:** When a patient enters the emergency room in a non-traumatic coma, immediate medical or surgical action must be taken. Therefore, understanding the most common causes of non-traumatic altered mental status (AMS) and related mortality may help with these patients' care.

**Aim:** The study aimed to examine the clinical characteristics of adult patients who report to the emergency room in an AMS but have no prior head injury.

**Materials and methods:** A total of 112 patients who presented to our hospital with AMS were enrolled in this prospective observational study, which was conducted over a one-year and six-month period in the emergency department of a tertiary-care hospital. A previously created case registration form was used to gather clinical records of patients with AMS in the emergency room, including their demographics, medical history, signs and symptoms upon admission, diagnosis, clinical assessment techniques, and emergency management and outcome.

**Results:** Most patients were men aged >40 years. The reasons for AMS were neurological, followed closely by metabolic and viral factors. The study indicates that bacterial meningoencephalitis, hepatic coma, organophosphorus (OP) poisoning, intoxication, infarcts, and intracerebral haemorrhage are the main causes of AMS and are associated with lower mortality.

**Conclusion:** The most frequently encountered diagnostic categories causing AMS were primarily neurological, but they differed from similar studies, indicating significant variability in the aetiologies in studies conducted in diverse demographic settings and the need for large-scale, multicenter studies.

**Keywords:** Alcoholism, Altered mental status, Infection, Metabolic disorder, Neurological disorders, Non-traumatic, Toxins.

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## INTRODUCTION

Altered mental status (AMS) is a collection of clinical symptoms rather than a specific diagnosis, including cognitive, attention, and arousal disorders and a reduced level of consciousness. An AMS is typical in the emergency room, particularly among older patients.<sup>1</sup> However, the word AMS is not particularly precise, as it is also known by other terms such as lethargy, disorientation, changed behaviour, disorientation, and so on. The time course and severity of AMS differed between groups. Acute changes in the mental state are typically the result of delirium, stupor, or coma, all of which are symptoms of acute brain malfunction. These changes occur over hours or days and are frequently caused by potentially fatal underlying medical diseases. Chronic changes in mental state (e.g., dementia) develop over time and are less likely to be prompted by a life-threatening disease.<sup>2</sup>

In non-trauma patients, disorders of consciousness, including coma, can be induced by a wide range of illnesses affecting the central nervous system (CNS).<sup>3</sup> This comprises life-threatening medical, neurological, or neurosurgical situations that require immediate medical attention. In Emergency Departments (EDs), 59% of patients experience acute non-traumatic disturbances of consciousness, and up to 2% are comatose at admission. As a result, emergency care is a common challenge. Furthermore, they are accompanied by a relatively high in-hospital death rate.<sup>4</sup> This uncertainty in nomenclature has severe implications for this ailment because it cannot be adequately recorded and, hence, cannot be examined specifically, causing complications in research. The intensity and course of AMS vary similarly varied.<sup>5</sup> The brain

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can undergo rapid changes in minutes or hours, often due to life-threatening medical conditions. These acute alterations differ from chronic changes that happen over months or years and pose less immediate danger. Studying patients in comas, especially those in a vegetative state, sparks ethical and financial debates in the West. In contrast, India prioritises determining the outcome, whether death or recovery, to guide care decisions.<sup>6,7</sup>

Non-traumatic coma is a dangerous condition that requires immediate medical or surgical intervention upon arrival at the ER. Therefore, understanding the most common aetiology of non-traumatic AMS and its related mortality may aid in caring for these individuals. Very few studies have examined the causes and outcomes of AMS due to non-traumatic reasons. These data will be added to previous research to examine individuals with changed mental states completely.<sup>7</sup>

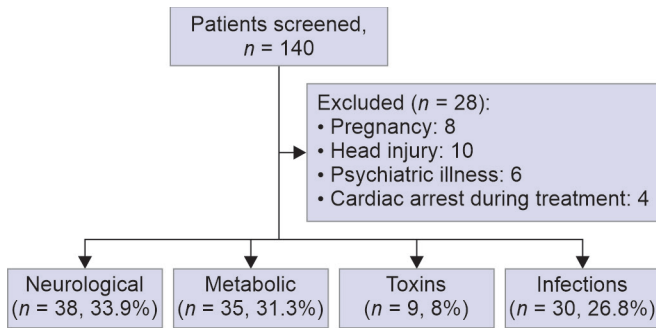


Fig. 1: Using a pre-designed form, ED staff collected data

**AIM**

This study aimed to determine the aetiology of patients presenting with an altered mental status in the ED.

**MATERIALS AND METHODS**

This prospective observational study was conducted on 112 patients presenting with altered mental status in the ED of a tertiary-care hospital for one year (November 2022–October 2023). The study was initiated before the approval of the ethical committee, and informed consent was obtained from all participants.

**Inclusion Criteria**

Patients aged >18 years and those with altered mental status (GCS <15) were included.

**Exclusion Criteria**

Patients with pregnancy, head injury, psychiatric illness, and cardiac arrest during emergency treatment were excluded.

Using a pre-designed form, ED staff collected data on patients experiencing altered mental status. The form covered demographics, medical history, admission vitals and symptoms, lab tests, imaging results, diagnoses, assessment methods, and initial treatment and outcome. All patients were observed for at least 24 hours after admission.

**Statistical Analysis**

The data were entered into an SPSS spreadsheet and double-checked. The analysis was performed using SPSS version 27.0 for Windows. Descriptive analyses, such as mean, standard deviation, and percentage, exhibit the clinical parameters considered in the research pro forma. All statistical tests were performed at a 5% ( $p \leq 0.05$ ) significance level.

**RESULTS**

Among the 112 patients admitted, 63.4% were male, and the majority belonged to the age-group 61–70, followed by 51–60. Individuals aged <30 were admitted at the lowest frequency (8.9%). Patients under the age-group of 41–50 (19.6%), 31–40 (13.4%), and >71 (11.6%) were also found to have been admitted in significant numbers. Upon arrival, 76.8% of the patients presented with vomiting, followed by headaches (56.3%) (Fig. 1). Giddiness (39.3%), fever (37.5%), convulsions (23.2%), and melena/haematemesis (17.9%) were also observed among the other symptoms (Table 1).

A total of 19.6% were diagnosed with smoking and 27.7% were diagnosed with alcoholism. Patients were observed to have various

Table 1: Patient demographic data of the study

Characters	Number of patients	Percentage
<b>Age-group</b>		
<30	10	8.9%
31–40	15	13.4%
41–50	22	19.6%
51–60	25	22.3%
61–70	27	24.1%
>71	13	11.6%
<b>Gender</b>		
Female	41	36.6%
Male	71	63.4%
<b>Sign and Symptoms</b>		
Headache	63	56.3%
Vomiting	86	76.8%
Fever	42	37.5%
Giddiness	44	39.3%
Convulsions	26	23.2%
Melena/Haematemesis	20	17.9%
<b>Addiction</b>		
Smoking	22	19.6%
Alcoholism	31	27.7%
<b>Comorbidities</b>		
Exposure to STDs	6	5.4%
HT	38	33.9%
DM	38	33.9%
CAD	39	34.8%
Dyslipidaemia	44	39.3%
BA/TB/COPD	27	24.1%
CVA	36	32.1%
Seizure	6	5.4%
DCLD	13	11.6%

comorbidities, with dyslipidaemia being the most common (39.3%), followed by CAD (34.8%). Other comorbidities, such as hypertension (33.9%), diabetes (33.9%), and CVA (32.1%), along with BA/TB/COPD (24.1%), were also observed at significantly higher rates. Exposure to STDs (5.4%), DCLD (11.6%), and seizures (5.4%) were also observed.

Among the etiological causes of AMS, infections, toxins, and metabolic and neurological disorders have been reported. Among the 26.8% of patients identified with infections, 33.3% were diagnosed with bacterial meningoencephalitis and 20% with tuberculous meningitis and other infectious diseases. A total of 16.7% of patients were diagnosed with cerebral malaria and 10% with viral encephalitis.

Among metabolic disorders (31.3%), hepatic coma (37.1%) and uraemic coma (22.9%) were detected at higher frequencies. Hypoxia and hypoglycaemia were diagnosed in 14.3% of the patients. Hypercapnia and hyponatraemia were found in 5.7% of patients. Toxins contribute to only 8% of the etiological causes of AMS. Organophosphorus (OP) poisoning contributed to 50, 37.5, and 25% of drug and snake bites, respectively. Neurological disorders contributed to 33.9% of the AMS aetiology, including infarct (42.1%), intracerebral haemorrhage (38.6%), subarachnoid haemorrhage (13.2%), and cerebral venous thrombosis (7.9%). Mortality was observed in 17.9% of the admitted patients (Table 2).

**Table 2:** Etiological causes of AMS

<i>Etiological causes</i>	<i>Number of patients</i>	<i>Percentage</i>
Infection (26.8%)		
Bacterial meningoenzephalitis	10	33.3%
Cerebral malaria	5	16.7%
Others	6	20%
Tuberculous meningitis	6	20%
Viral encephalitis	3	10%
Metabolic disorders (31.3%)		
Hepatic coma	13	37.1%
Hypercapnia	2	5.7%
Hypoglycaemia	5	14.3%
Hyponatremia	2	5.7%
Hypoxia	5	14.3%
Uremic coma	8	22.9%
Toxins (8%)		
Drug overdosage	3	37.5%
Organophosphorus poisoning	4	50%
Snakebite	2	25%
Neurological disorders (33.9%)		
Cerebral venous thrombosis	3	7.9%
Infarct	16	42.1%
Intra-cerebral haemorrhage	14	36.8%
Subarachnoid haemorrhage	5	13.2%

## DISCUSSION

Non-traumatic brain injury (nTBI) is an insult to the brain that affects its structure or function and results in impairments in cognition, communication, physical function, and psychosocial behaviour. These insults to the brain can be brought on by tumours, infectious diseases, hypoxic injuries, metabolic disorders, and toxic exposure, but not by congenital, degenerative, or trauma-induced conditions.<sup>1</sup> While nTBI treatment costs triple that of TBI, for the 10% sent to inpatient rehab, rehab itself is only about 33% of overall expenses.<sup>8</sup>

In our study, more male patients were admitted to AMS. Earlier, similar investigations also supported a higher incidence of AMS in men.<sup>1,9,10</sup> Thus, despite the possibility that there may not be a substantial difference, this research indicates that the altered mental status condition is more prevalent in men than in women. Patients older than 60 accounted for the highest number, with patients aged 41–70. Additionally, Nomula et al. documented AMS in patients older than 30.<sup>11</sup> Xiao et al. also reported the mean age of AMS patients in their study to be 51.<sup>1</sup>

Substance abuse is associated with various physical, psychological, and social problems. Substance misuse was found in 53% of the patients, with 27.7% being alcoholics and 19.6% being smokers. Increased rates of such behaviours are linked to post-traumatic stress disorder (PTSD) with CNS depressants, such as alcohol, cannabis, opioids, and benzodiazepines, significantly enhancing.<sup>12</sup> The detrimental effects of drinking and smoking on brain growth and damage are likewise confirmed by Volkow et al.<sup>13</sup>

Given the high expenditure on inpatient rehabilitation, it is crucial to comprehend the variables that affect these patients' results for effective management. The presence of comorbid health conditions can affect healthcare outcomes. The prevalence of people with comorbid medical conditions is increasing; therefore, it

is crucial to assess comorbidities. This distinct clinical condition may occur during the patient's clinical course. In assessing the existence of comorbidities in our study, dyslipidaemia, hypertension, and diabetes were found to be more prevalent. Similar comorbid factors dominated patient profiles with AMS in many studies.<sup>14,15</sup>

Clinical treatments for various clinical manifestations of AMS are greatly influenced by various pathogenic causes that contribute to these manifestations. Therefore, identifying the origin of AMS is crucial. Emergency AMS's aetiology is typically divided into main nervous system and non-neurological causes.<sup>9</sup> According to a recent study, neurological events—which account for around 28% of AMS patients—are the most significant variables that induce the condition.<sup>15</sup>

We also observed that metabolic abnormalities, infections, poisons, and neurological disorders were other major etiological causes of AMS. Xiao et al. previously observed a similar dominance in neurological illness as the primary aetiology of AMS.<sup>1</sup> Similar to our work, Nomula et al. find a substantial influence of infection on the development of AMS.<sup>11</sup> Metabolic disturbances accounted for 35% of disturbed mental status, comparable to the figures reported by Jali et al. (28%) and Nomula et al. (22.5%).<sup>10,11</sup> Still, Xiao et al. (7.9%) indicated a lower rate as the cause of AMS.<sup>1</sup> Studies like Kekec's (71.6%) and Leong's (34.4%) found that neurological problems, including intra-cerebral haemorrhage and infarction, were more prevalent, similar to ours.<sup>16,17</sup>

We also discovered that toxins were the cause of 9% of AMS patients, which is a lower rate than that reported by Xiao et al. (23%) and Kekec (1.5%).<sup>1,16</sup> In the ED, drug and substance intoxication were among the other non-neurological causes of AMS. Acute alcoholism was observed to be the primary neurological cause of AMS. A similar predominance of alcoholism as a contributing factor to AMS was reported by Xiao et al. Additionally, they claimed that organ and system failures are key contributors to acute AMS. Among the patients with AMS, 9.8% had cardiovascular and respiratory diseases. Organ failure is a significant and potentially deadly complication in AMS patients.<sup>1</sup>

Trauma and infection are two significant variables that contribute to acute AMS. According to Yagmur et al., trauma is the second leading cause of emergency AMS and is responsible for 39% of all AMS fatalities, predominantly head trauma.<sup>18</sup> However, not all nations and locations have the same aetiology for AMS. Our study also showed that 16.7% of cerebral malaria is an etiological cause of AMS. Because of the potentially deadly and irreversible harm caused by AMS, various unusual conditions that induce it should be considered, including acute fatty liver during pregnancy, disorders connected to the environment, and adrenal insufficiency. As a result, the aetiology of AMS varies among researchers. Differences in sample sizes might bring about patient selection representative of each aetiology and study condition.

A mortality rate of 17.9% was observed in the present study. This is consistent with information provided by Leong et al.<sup>17</sup> The death rate reported by Xiao et al. was much lower (8.1%).<sup>1</sup> An increased death rate of 34% was reported by Nomula et al., who associated the lack of reflexes with a higher fatality rate in their case studies.<sup>11</sup> This was also affirmed in the report published by Jali et al., who attribute the absence of oculocephalic reflexes to the higher mortality of AMS patients.<sup>10</sup>

Acute AMS can be fatal, and AMS should be considered an admission requirement and part of the comprehensive treatment of diseases. These patients, especially the elderly, should receive

urgent treatment, close monitoring, and rapid evaluation at the first sign of acute AMS. The cause of AMS in patients cannot be precisely identified from the moment it first manifests in the ED. The condition frequently progresses to potentially fatal respiratory and muscular failure without prompt detection. As a result, emergency physicians still struggle to conduct thorough emergency assessments and provide rapid life-saving interventions.

## CONCLUSION

Males and elderly patients comprised most of those with impaired mental status. In the current investigation, altered mental status was most frequently caused by neurological causes, closely followed by metabolic and infectious causes. According to our study, the main causes of AMS include bacterial meningoenzephalitis, hepatic coma, OP poisoning, drunkenness, infarcts, and intracerebral haemorrhage. However, compared to previous research of a similar nature, our study found a reduced death rate, demonstrating significant variations in aetiologies in studies conducted under various demographic conditions.

## Limitations

The sample size was small, and given that it was a single-centre study, it was difficult to draw valid conclusions. However, this study could serve as a test run for larger studies.

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