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Original Contribution

Etiologies and delirium rates of elderly ED patients with acutely altered mental status: a multicenter prospective study☆,☆☆

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ABSTRACT

Objectives: Altered mental status (AMS) is a challenging diagnosis in older patients and has a large range of etiologies. The aim of this study was to investigate the nature of such etiologies for physicians to be better aware of AMS backgrounds and hence improve outcomes and mortality rates.
Methods: This prospective observational study was conducted at 4 emergency departments. Patients 65 years and older who presented to the emergency department with acute AMS (≤1 week), with symptoms ranging from comas and combativeness, were eligible for inclusion in this study. The outcomes, etiologies, Richmond Agitation and Sedation Scale scores, and the presence of delirium were recorded.
Results: Among 822 older patients with AMS, infection (39.5%) and neurological diseases (36.5%) were the most common etiologies. The hospital admission and mortality rates were 73.7% (n = 606) and 24.7% (n = 203), respectively. The mortality rate rose if AMS persisted for more than 3 days. Delirium was observed in 55.7% of the patients; these individuals had higher durations of AMS than those without delirium (median, 24 hours; interquartile range, 3-48 hours; median 6 hours, interquartile range, 3-48 hours, respectively; $P = .010$). Notably, delirium was observed in more than two-thirds of neurological patients.
Conclusions: The most common causes of AMS were infection and neurological diseases. Delirium was associated with AMS in nearly half the patients. Moreover, the rates of hospitalization and mortality remained high.

1. Introduction

Altered mental status (AMS) is common in older patients admitted to emergency departments (EDs). The ratio of older patients with AMS in EDs is 41%-60%. Whereas the diagnosis of AMS in younger patients is more straightforward and can be attributed to obvious toxicological or organ-specific disorders, diagnosis is more difficult in older patients. Moreover, mortality rates are higher in the elderly [1-3]. Therefore, such patients require urgent stabilization, accurate diagnosis, and appropriate treatment.

Patients who present with AMS exhibit various levels of consciousness (LOCs) ranging between comas and combativeness; these LOCs are categorized by the Richmond Agitation and Sedation Scale (RASS) [4]. Delirium, an acute disorder of cognition, may accompany these symptoms; however, its prevalence is unclear among older patients with AMS [5,6]. Although the consequences of AMS have been reported in the literature, there have been no investigations of the consequences of the coexistence of delirium and AMS. The brief confusion assessment method (bCAM), which assesses the presence of delirium, can be used for this purpose [7].

Unlike previous studies that tended to be single-center analyses, this comprehensive AMS study was performed at 4 different EDs. We aimed to identify the etiologies of acute AMS, previous AMS histories, and coexistence of delirium in older patients to gain a better understanding of AMS and thus more properly manage elderly patients.

2. Methods

2.1. Study design

We performed a prospective observational study of a convenience sample of ED patients between June 1, 2015, and May 31, 2016, during which all patients encountered by participating physicians who met the inclusion criteria (described below) were enrolled. The ethics committees of all institutions approved the study, and written informed consent was obtained from patients' surrogates.

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2.2. Study setting and population

The study was conducted at 4 EDs in Istanbul, Ankara, Nevsehir, and Kirsehir in Turkey, including 2 tertiary care academic institutions and 2 nonacademic departments. Three attending and 2 senior resident ED physicians participated in data collection and patient assessment in this study; these physicians were involved in the follow-up of AMS patients 65 years and older during their 12/24-hour clinical shifts. AMS was considered to be present if a patient had exhibited any of the following symptoms for less than 1 week at the time of presentation to the ED: Glasgow Coma Scale (GCS) scores <15, acute change in LOC, time and/or location disorientation, difficulty remaining awake, inability to respond to verbal or physical stimulation, confusion, irritability or aggressiveness, and any other inappropriate behavior. Exclusion criteria were as follows: patients with unknown outcomes, terminally ill patients at baseline (comatose bedridden patients), major trauma patients, and patients presenting with cardiac arrest.

2.3. Study protocol

There are 2 related areas of neurologic function that are connected to consciousness: content (orientation and memory) and level (arousal and response to stimuli) [5]. However, because content features could not be evaluated properly in AMS patients, consciousness assessment was performed according to the LOC. The RASS is a reliable method for determining LOC; the score ranges from −5 (coma) to +4 (combative) (Fig. 1). The patient is initially observed and deemed to be "RASS 0" if he/she is alert and calm. A hyperalert patient is assigned a score between +1 and +4. If the patient is lethargic and responds to voice stimulation, the score is between −1 and −3. If the patient only responds to physical stimulation or is unresponsive, the score is −4 (stupor) or −5 (coma) [4]. GCS and RASS scores were evaluated when the patients first presented to the ED.

Although there are formal methods for the assessment of delirium according to the fifth edition of the *Diagnostic and Statistical Manual of the American Psychiatric Association*, the Geriatric Emergency Department Guidelines recommend a 2-step approach because of simplicity and time [8]. The first step, the delirium triage screen, includes LOC assessment and recommends proceeding to the second step if LOC is impaired. Therefore, only the second step, the bCAM, was used for determining delirium because AMS patients usually have impaired LOC. bCAM is a brief (<1 minute) and highly specific (95%) method [7] that tests 4 conditions. For the diagnosis of delirium, conditions 1 (AMS or fluctuating course) and 2 (inattention) should be met, followed by either condition 3 (impaired LOC) or 4 (disorganized thinking). Delirium assessment was performed within 24 hours of the patients' admission to the ED by emergency physicians informed and trained in the local language. Patients were assessed for delirium if they were awake, were able to respond to commands, and did not have severe dementia.

Final diagnoses were recorded by ED physicians and were confirmed by consulting physicians at the ED. When the diagnoses were uncertain during the ED follow-up, that information was obtained from hospital records and ward or intensive care unit (ICU) physicians. Other patient characteristics recorded included age, sex, duration of AMS, consultation, admission and outcomes, and previous similar AMS history and time of occurrence (<1, 1-6, or >6 months). Information on similar history and duration of AMS was obtained from surrogates, medical records, or the patients themselves if possible. The patient evaluation steps followed for this study are presented in Fig. 2.

2.4. Data analysis

Statistical analyses were performed using IBM SPSS statistical package for Windows, version 21.0. Continuous variables were presented as median values and interquartile ranges (IQRs). Categorical variables were summarized as frequencies and percentages. Normality of the continuous variables was evaluated using the Shapiro-Wilk test. The differences between 2 groups according to continuous variables were determined by the Mann-Whitney *U* test. Comparisons between more than 2 groups were conducted using Kruskal-Wallis tests. Categorical variables were compared using the Pearson χ^2 or Fisher exact test. The area under the receiver operating characteristic curve was calculated to determine the relationship between the duration of AMS and the presence of delirium. An α critical value of .05 was accepted as statistically significant.

3. Results

Of 988 patients treated between June 1, 2015, and May 31, 2016, 822 were enrolled in the study. Among these patients, the median age was 77 years (IQR, 70-83 years), and 52.3% were women. The duration of AMS was a median of 8 hours (IQR, 3-48 hours); 9.5% of the patients presented to the ED within 1 hour of onset of AMS symptoms, 41.5% within 2-8 hours, 12.9% within 9-24 hours, 25.2% within 25-71 hours, and 10.9% within 72-168 hours. The numbers of requested consultations were 1 for 53% of the patients, 2 for 33.9%, and at least 3 for 7.1%. Six percent of the patients did not receive additional hospitalization or management.

The hospital admission and mortality rates among all patients were 73.7% (n = 606) and 24.7% (n = 203), respectively. The rate for ICU admission was 44.6% (n = 367); the mortality rate among these patients was 43.9% (n = 161). The admission rate to the wards was 29.1% (n = 239); among these patients, the mortality rate was lower, at 5.4% (n = 13). Of all patients, 22.7% (n = 187) were discharged from the ED and 3.5% (n = 29) died during follow-up in the ED.

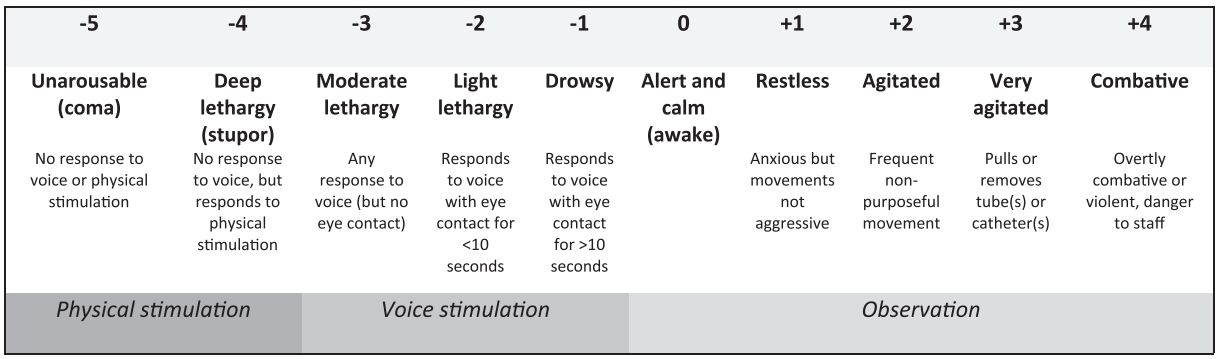

Fig. 1. Richmond Agitation and Sedation Scale (adapted from Sessler et al, The Richmond Agitation-Sedation Scale: validity and reliability in adult intensive care unit patients. *Am J Respir Crit Care Med*. 2002;166[10]:1338-44).

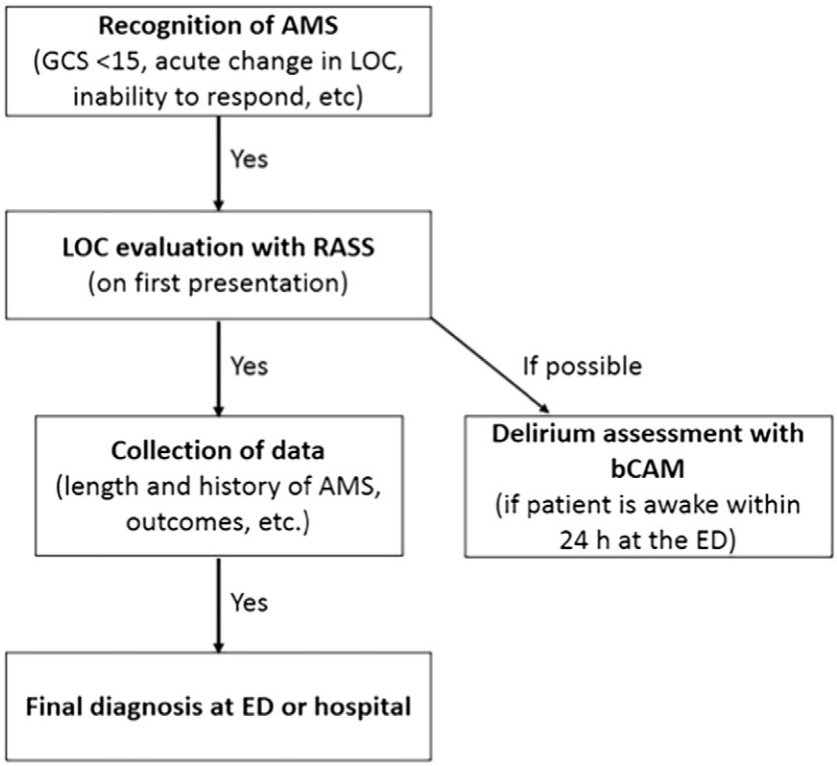

Fig. 2. Patient evaluation steps performed by ED physicians in this study.

Patients were grouped into 3 RASS score categories as shown in Table 1. Coma-stupor (RASS −5 and −4) was observed in 17.3% of the patients (3.2% and 14.1%, respectively); lethargy (RASS −3, −2, and −1) was observed in 59.6% patients (17.0%, 22.3%, and 20.3%, respectively); and awakeness-hyperalertness (RASS 0 +1, +2, +3, and +4) was observed in 23.1% of the patients (7.2%, 10.7%, 4.9%, 0.4%, and 0.0%, respectively) ($P < .001$). The duration of AMS in the lethargic group was longer (median, 24 hours; IQR, 3-48 hours) than that of the other 2 groups (median, 6 hours for both; IQR, 2-30 hours and 3-48 hours, respectively) (Kruskal-Wallis; $P = .001$). The rate of delirium was highest in coma-stupor patients at 75.9% (among assessable patients), followed by 60% in awake-hyperalert patients and 52.0% in lethargic patients (χ^2; $P < .021$). The rates of previous similar AMS episodes were similar in all groups. Whereas the rates of ICU admission and mortality were the highest in the coma-stupor group (82.4% and 43.7%, respectively), those in the awake-hyperalert group were the lowest (24.2% and 10.5%, respectively) (χ^2; $P < .001$).

Mortality rates peaked during 2 different AMS durations; within 1 hour (≤1) and at 72 hours and after (≥72), the mortality rate was higher (35.1%, n = 59) than during other periods (22.0%, n = 144) (odds ratio [OR], 1.92; 95% confidence interval [CI], 1.33-2.77) (χ^2; $P < .001$). Whereas infection and neurological disorders were more often observed within 1 hour (OR, 8.1; 95% CI, 1.54-42.6 and OR, 3.07; 95%, 1.53-6.14, respectively), there was no significant difference among disease groups at 72 hours and after.

3.1. Etiologies

Among the etiologies of 822 elderly patients with AMS, infection (39.5%) and neurological diseases (36.5%) were the most common

Table 1
The characteristics of patients categorized by RASS groups

	Coma-stupor (RASS −5, −4)	Lethargic (RASS −3, −2, −1)	Awake-hyperalert (RASS 0, +1, +2, +3, +4)	*P*
n (%)	142 (17.3%)	490 (59.6%)	190 (23.1%)	<.001
Age (y), median (IQR)	77 (71-83)	78 (71-83)	75 (68-82)	.010
Time of AMS, median h (IQR)	6 (2-30)	24 (3-48)	6 (3-48)	.001
GCS, median (IQR)	7 (6-9)	13 (11-14)	14 (13-14)	<.001
Delirium, n (%)[a]	22 (75.9%)	171 (52.0%)	86 (60.1%)	.021
Similar AMS history	41.5%	39.6%	34.2%	.323
Etiologies				
• Infection	34.5%	43.3%	33.7%	.029
• Neurological	40.8%	35.3%	36.3%	.482
• Metabolic/electrolytic	18.3%	17.1%	16.8%	.934
• Cardiac/pulmonary	19.0%	14.9%	11.6%	.169
• Gastrointestinal	3.5%	5.9%	6.8%	.416
• Trauma/toxicologic	4.2%	3.3%	2.6%	.722
• Others	4.9%	1.6%	6.3%	.004
Multiple diagnoses	22.5%	20.4%	14.2%	.106
ICU admission	82.4%	41.6%	24.2%	<.001
Mortality	43.7%	24.7%	10.5%	<.001

[a] Delirium assessment was possible for 501 patients (60.9%). Kruskal-Wallis and Pearson χ^2 tests were used.

Table 2
Etiologies of AMS (822 patients aged ≥65 years)

Etiologies of AMS	n (%)[a]
Infection	**325 (39.5%)**
• Pneumonia	207 (25.2%)
• Urinary tract infection	78 (9.5%)
• Sepsis	24 (2.9%)
• Meningitis/encephalitis	8 (1%)
• Typhlitis/gastroenteritis	5 (0.6%)
• Abscess/cellulitis	3 (0.4%)
Neurological	**300 (36.5%)**
• Ischemic stroke	190 (23.1%)
• Intraparenchymal hemorrhage	44 (5.4%)
• Status epilepticus/prolonged postictal	31 (3.8%)
• Intracranial mass/shift	14 (1.7%)
• Chronic subdural/SAH	9 (1.1%)
• Nonconvulsive status	5 (0.6%)
• Parkinson/Alzheimer exacerbations	2 (0.2%)
• Other (TIA/hydrocephalus)	5 (0.6%)
Metabolic/electrolyte	**142 (17.3%)**
• ARF/uremic encephalopathy	62 (7.5%)
• Hypo-/hyperglycemia	36 (4.4%)
• Hypo-/hypernatremia	33 (4.0%)
• Hypo-/hyperkalemia	8 (1.0%)
• Other (hypercalcemia/disequilibrium syndrome)	3 (0.4%)
Cardiac/pulmonary	**122 (14.8%)**
• COPD/CO_2 retention	37 (4.5%)
• Congestive heart failure	29 (3.5%)
• AMI/NSTEMI	22 (2.7%)
• Pulmonary embolism	15 (1.8%)
• Complete atrioventricular block/arrhythmia	8 (1.0%)
• Hypoxia	4 (0.5%)
• Aortic aneurysm rupture/dissection	3 (0.4%)
• Hypertensive encephalopathy	2 (0.2%)
• Other (infective endocarditis/pneumothorax)	2 (0.2%)
Gastrointestinal	**47 (5.7%)**
• GI hemorrhage/anemia	20 (2.4%)
• Hepatic failure/Encephalopathy	19 (2.3%)
• Pancreatic and biliary diseases	5 (0.6%)
• Gastrointestinal perforation/ileus	3 (0.4%)
Trauma/toxicologic	**27 (3.3%)**
• SAH/epidural/subdural	9 (1.1%)
• New drugs/overdose	9 (1.1%)
• Intoxication (CO, methanol, organophosphates)	7 (0.9%)
• Alcohol intake/hypothermia	2 (0.2%)
Others	**27 (3.3%)**
• Unknown	21(2.6%)
• Psychosis/conversion	2 (0.2%)
• Chronic schizophrenia deterioration	2 (0.2%)
• Anaphylaxis/vestibular neuritis	2 (0.2%)

SAH, subarachnoid hemorrhage; TIA, transient ischemic attack; ARF, acute renal failure; COPD, chronic obstructive pulmonary disease; AMI, acute myocardial infarction; NSTEMI, non–ST-elevation myocardial infarction; CO, carbon monoxide; GI, gastrointestinal.
[a] A total of 19.3% of patients had multiple diagnoses.

(Table 2), followed by metabolic-electrolytic (17.3%), cardiopulmonary (14.8%), and gastrointestinal (5.7%) diseases. Trauma-toxicologic and other diagnostic groups comprised 3.3% of the cases or less.

The most common diagnoses were pneumonia (25.2%), ischemic stroke (23.1%), urinary tract infection (9.5%), acute renal failure/uremic encephalopathy (7.5%), and intracranial parenchymal hemorrhage (5.4%). Furthermore, 19.3% of the patients had multiple diagnoses. Etiology was undetermined in 21 patients (2.6%), among whom the mortality rate was 38.1%.

The mortality rate was higher in patients with cardiac and pulmonary diseases (35.2%) and lower in those with trauma and toxicologic diseases (18.5%) (Table 3). Among our patients, 38.7% had a history of AMS; these events occurred in the previous month in 49 patients (15.4%), 1-6 months prior in 98 patients (30.8%), and more than 6 months before in 171 patients (53.8%). Most prior AMS events occurred in the gastrointestinal system (53.2%), or else involved infection (44.6%)

Table 3
The rates of delirium, AMS history, and mortality among etiologic groups

	Delirium[a] %	AMS history %	Mortality %
Infection	47.4%	44.6%	24.6%
Neurological	69.1%	34.7%	25.0%
Metabolic/electrolytic	51.1%	42.3%	25.4%
Cardiac/pulmonary	38.7%	34.4%	35.2%
Gastrointestinal	60.0%	53.2%	23.4%
Trauma/toxicologic	60.0%	22.2%	18.5%
Others	90.0%	33.3%	29.6%
All, % (n)	55.7% (279)	38.7% (318)	24.7% (203)

[a] Delirium assessment could be made in 60.9% of patients (501 patients).

and metabolic-electrolytic diseases (42.3%). Hepatic failure/encephalopathy was the most common diagnosis (78.9%), whereas 58.3% had sepsis and 52.8% had hypo-/hyperglycemia. There was no significant difference between history of AMS and mortality.

3.2. Delirium

Delirium was assessable in 60.9% of patients (n = 501) and was observed in 55.7% of these individuals (n = 279). Delirium could not be assessed in other patients because of their consciousness levels. The delirium rate was 69.1%, 47.4%, and 38.7% in patients with neurological diseases, infections, and cardiac-pulmonary diseases, respectively (Table 3).

Whereas patients with delirium experienced AMS for a median of 24 hours (IQR, 3-48 hours), those without delirium experienced AMS for a median of 6 hours (IQR, 3-48 hours); this difference was significant (Mann-Whitney U; $P = .010$). However, the duration of AMS and delirium rates were poorly correlated (area under the receiver operating characteristic curve, 0.56; 95% CI, 0.52-0.62). The ICU admission rate of delirious patients was higher than that of nondelirious patients (32.6% [91 patients] and 18.9% [42 patients], respectively) (OR, 2.07; 95% CI, 1.36-3.15) (χ^2; $P = .001$). Whereas the mortality rate was 12.9% (n = 36) in patients with delirium, that of patients without delirium was 8.1% (n = 18); however, this difference was not significant (OR, 1.68; 95% CI, 0.93-3.05) (χ^2; $P = .086$). Delirium was observed in 46.5% of the patients discharged from the ED; this rate was 54.3% for ward admissions and 68.4% for ICU admissions.

4. Discussion

Chronic changes in mental status often occur over months and years and do not necessarily require urgent intervention. Acute changes in mental status develop within hours and days and require critical care because of life-threatening sequelae. Determining the correct diagnosis is crucial for providing proper treatment. Because EDs are often the first point of contact with physicians, definitive diagnosis and critical care in these locations are very important for older AMS patients [5,9].

The high hospitalization and mortality rates due to AMS have not decreased over time. The first ED-based AMS study conducted in the 1990s showed that the rate of hospitalization was as high as 74%, whereas the mortality rate was 29% [10]. More recent studies reported that hospitalization rates for all ages were between 64% and 72%, whereas mortality rates in elderly patients were between 11% and 41% [1,2,11]. In our study, the rates of hospitalization and mortality were 73.7% and 24.7%, respectively.

Coma-stupor (RASS −5 and −4) is an emergency regardless of the underlying cause; stabilization of such patients should be an immediate priority. Once accomplished, the underlying etiologies should be identified and treated [12]. A study of comatose ED patients with GCS scores ≤10 found that diseases of neurological, infectious, and cardiac-pulmonary etiologies were common in older patients. In the same study, mortality rates ranged between 26% for infections and 71% for cardiac diseases [13]. In our study, the etiologies were similar in the coma-

stupor group. Furthermore, hospitalization and mortality rates were 82.4% and 43.7%, respectively. These rates were lower in the awake-hyperalert (ie, RASS 0, +1, +2, +3, and +4) group (24.2% and 10.5%, respectively).

Delirium is observed very frequently in comatose or critically ill patients. An ICU study reported that the delirium rate was 83.7% in mechanically ventilated comatose patients [14]. This rate was 75.9% in the coma-stupor group in our study.

There are 2 noteworthy considerations regarding the duration of AMS. First, whereas this duration was 6 hours (median) in the coma-stupor and awake-hyperalert groups, it was as high as 24 hours in the lethargic group. We postulate that this is due to the symptoms of lethargic patients being silent and obscure, or else being mistaken for a patient's normal progress. Therefore, the severity of the disease is not realized by family members or caregivers until later. Second, mortality rates were higher in the patients who presented to the ED within the first hour (≤1), and at 72 hours or later (≥72). Patients presenting within 1 hour had more serious diseases such as stroke or sepsis and therefore had high mortality rates. However, there was no significant difference among the types of diseases in patients presenting to the ED 72 hours after AMS onset or later. This may be attributed to a compensation mechanism triggered by AMS that subsides after 3 days or else may indicate effects that may have become permanent over the 3 days that elapsed. Data in the literature regarding this issue are insufficient.

4.1. Etiologies

AMS has a lengthy diagnostic process; therefore, physicians should be aware of the differential diagnoses and ought to consider a range of clinical possibilities. However, if the initial diagnosis is incorrect, the consequences can be detrimental and lead to mortality [15].

Infection and neurological diseases were the most common causes of AMS, although this is not consistent with some other studies [2,3,10]. The 3 most common diagnoses were pneumonia, ischemic stroke, and urinary tract infections; these conditions were observed in almost half of all patients.

Renal/uremic pathologies and blood glucose disorders were common in metabolic-electrolytic diseases, whereas chronic pulmonary and heart disorders were common in cardiopulmonary diseases. The mortality rate was also higher in patients with pulmonary and cardiac diseases, although point-of-care ultrasonography can reportedly detect these diseases easily [16,17].

Multiple diagnoses in AMS patients are reported in the literature; however, their rate is unclear [3]. In our study, 1 of 5 patients had more than 1 diagnosis, with prevalences similar across RASS groups. Moreover, our study had a lower percentage of patients with unknown etiologies than the others [2,10]; this may have been related to increased diagnosis rates owing to improved examination methods. However, mortality rates were higher in undiagnosed patients.

Although obtaining a patient's history is often time consuming, it is nevertheless necessary to better understand the patient's condition. This information, which often cannot be extracted from patients themselves, should be obtained from a relative, caregiver, or hospital records. History of AMS is one of these parameters, and familiarity with the causes of previous AMS episodes is important. Xiao et al [2] reported that 40% of AMS patients were diagnosed based on their medical history, whereas 32% were diagnosed based on their previous history of AMS (including their medication history). In our study, 38% of patients had a previous AMS episode, and more than 40% of these patients experienced such an episode in the previous 6 months. Hepatic failure/encephalopathy, sepsis, and hypo-/hyperglycemia were the most common causes.

4.2. Delirium

AMS and *delirium* are terms that are used interchangeably in the literature. However, there are not enough data supporting the coexistence of these 2 concepts. A study by Han et al [18], which is the only other published investigation on the topic besides the current study, reported that the presence of AMS strongly increased the likelihood of delirium in older ED patients. In our study, delirium was observed in only half of the patients. This difference may be due to different methodologies as well as the number of patients in the study. However, *delirium* is defined as an acute neurological disorder of attention and cognition. Its cause in older patients is usually multifactorial, ranging between precipitating and predisposing factors [19]. Therefore, not all etiologies of AMS necessarily trigger delirium, as in the example of simple hypoglycemic attack.

The most common cause for delirium is infectious disease, the rate of which increases to 60% in older patients irrespective of AMS [5,20]. Similarly, in adult patients with neurological disease, this ratio is between 15% and 26% [21,22]. In our study, delirium was found in 69% of neurological patients with AMS, and this rate was much higher than in patients with infections. In neurological disorders, we postulate that neurochemical disturbances that cause AMS can trigger delirium; furthermore, central infections and some types of stroke have been shown to be associated with delirium [21,23].

Inouye [19] showed that, as long as precipitating factors are present, the rates of delirium increase depending on the intensity of exposure to such factors. In our study, patients with delirium experienced longer AMS durations than those without; the correlation was weak although statistically significant. It is possible that delirium was assessed only in the presence of AMS as a precipitating factor, although multiple factors may be responsible for developing delirium.

That delirium leads to poor outcome is shown in many studies. Similarly, ICU admission rates for delirium patients are higher because of its association with critical illnesses [6,20,24,25]. In our study, there was a greater requirement for ICU admission for patients with delirium; however, there was no significant difference in mortality rates. This may be related to the complexity and high mortality of AMS, as well as the inability to reassess delirium after hospitalization.

5. Limitations

Despite a large number of patients, some underlying diseases were not evaluated in our study. Because of cultural traits, alcohol use in elderly people is rare in Turkey, which is not the case in other published studies. Only 1 patient in our study had an alcohol-related diagnosis. Some rare diseases responsible for AMS development, such as adrenal gland–related diseases, were not observed in our study. Often, AMS diagnosis cannot be obtained in the ED because of complex symptoms. Hospitalization or even transfer of the patient to another center is required in such cases, making it difficult to obtain additional diagnoses.

Delirium can develop or disappear within hours and days. Only 1 delirium assessment was conducted on the patients of this study; subsequent delirium events after admission were not followed. In addition, patients who could not be awakened for assessment in the ED were not followed after hospitalization; therefore, delirium rates remained unknown in such patients. There is no comprehensive study associated with delirium assessment in patients with AMS in the literature. Therefore, the optimal time of assessment is not clear. We performed our own assessments at the earliest opportunity after patients were able to respond to questions and instructions.

6. Conclusions

AMS has a wide etiological window; in our study, infections and neurological diseases were the most common etiologies. Delirium was observed in almost half of our elderly AMS patients and was caused by various conditions. Therefore, AMS and delirium should be treated separately but evaluated carefully in these patients.

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