

Altered Mental Status Patients Associated Evaluations in the Medicine Department

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Received: 25-11-2022 / Revised: 25-12-2022 / Accepted: 30-01-2023

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Conflict of interest: Nil

Abstract

Background: Altered mental status (AMS) comprises a group of clinical symptoms rather than a specific diagnosis, and includes cognitive disorders, attention disorders, arousal disorders and decreased level of consciousness. Patients often manifest vague symptoms, thus, AMS diagnosis and treatment are highly challenging for general medicine physicians.

Material & Methods: Within the Department of General Medicine, SMS Medical College and the attached group of hospitals, Jaipur, our research team explored patterns in 150 AMS patients from June 2020 to May 2021 to conduct observational cross-sectional analytical study for their clinical presentation {according to Age [55.17±18.41], Gender [64% male and 36 % female], Laboratory parameters [RBS (106.7 mg/dl), Na⁺(136.7 mMol/L), K⁺(3.86 mMol/L), Cl⁻(98.14 mMol/L), UREA(46.93 mg/dl) and CREATININE(1.15 mg/dl)], Clinical Parameter [S.NH₃(25.5 Umol/L), TLC(11.89 1000/cumm), S.PCT(1.66 ng/ml), PCO₂(51.32 mmHg) and PO₂(74.26 mmHg)], Blood pressure (141.1/86.13 mmHg), Comorbidity [Hypertension (47.33%), ALD CLD PTHN (9.33%), T2DM (22.6%), COPD (16%), No comorbidity (14%) and other] and Personal History [44.66 % smoker and 13.33% alcoholic]}, neuroimaging (MRI Brain finding, CVA-ICH and CVA Infarct).

Results: At SMS Medical College, from assessed etiological diagnosis data of this study, we saw that 52.6% cases of neurological, 17.3% cases of CO₂ Narcosis, 10% cases of Hepatic Encephalopathy, 5.3% cases of Metabolic (Hypoglycemia), 4.66% cases of Metabolic (Hyponatremia), 4.00% cases of Septic Encephalopathy, 4.00% cases of Unknown Poisoning and 2.00% cases of Uremic Encephalopathy.

Conclusion: This study will demonstrate and provide early recognition, more clinical and etiological information on AMS, particularly in India.

Keywords: Altered Mental Status, Altered Sensorium, Clinical Feature.

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Introduction

Altered mental status(AMS) comprises a group of clinical symptoms rather than a specific diagnosis, and includes cognitive

disorders, attention disorders, arousal disorders, and decreased level of consciousness. [1] AMS is a very common

general medicine department case, but the exact etiology of many AMS patients is unknown.[1] Patients often manifest vague symptoms, thus, AMS diagnoses are highly challenging for general medicine physicians. [1] An in-depth understanding of the pathogenesis of AMS and complete patient assessment will help increase the diagnosis rate and ensure treatment accuracy. Current epidemiological studies rarely focus on AMS with very few studies worldwide. [2] Nevertheless, in the standardization of the general medicine department acuity level sponsored by a group of physicians at the Harvard medical school, AMS syndrome is significant to establish an emergency severe index (ESI) for which level 1 is "no response" (most critical level) and level 2 is "other acute changes in consciousness (drowsiness, mental confusion, disorientation, etc)" for timely diagnosis and efficient treatment. [3] This study was conducted with the aims to determine the clinical assessment methods, etiology among general medicine AMS patients.

Materials and Methods

This study was an observational Cross-Sectional Analytical Study. This study was conducted in the Department of General Medicine, SMS Medical College, and the attached group of hospitals, Jaipur, Rajasthan, India. This study conducted

from June 2020 to onwards for one year till sample size is achieved and 2 months for data compilation and analysis. The sample size was calculated 92 cases as per the previous study, showing 35 % morbidity in altered mental status (ASM) for 80% power, 0.05 an error, and 10 % absolute error. We have taken 150 cases.

The inclusion criteria for patient selection were: Glasgow coma score < 15, Socially withdrawn, Decreased cognitive function, Hallucinates, Confusion, Other abnormal behaviour.

Exclusion criteria for patient selection were:

1. Children aged < 14 years are excluded because of their poor representation (small sample size).
2. This study focused on AMS patients with acute exacerbation and symptoms lasting for < 1 week; hence, chronic AMS patients such as those with Alzheimer's and schizophrenia, or those with AMS symptoms for more than 1 week were excluded.
3. Patients who had experienced one-time AMS symptoms before hospitalization, with symptoms disappearing before general medical treatment, were excluded.

Results

Table 1: Distribution of patients according to Age.

S. No.	Age Distribution (in Years)	No. of Patients	Percentage
1.	20-40	39	26
2.	41-60	51	34
3.	61-80	50	33.33
4.	>80	10	6.66
Total		150	100
Mean±SD		55.17±18.41	

Table 2: Distribution of patients according to Gender.

S.No.	Gender Distribution	No. of Patients	Percentage
1.	Female	54	36
2.	Male	96	64
	Total	150	100

Table 3: Distribution of patients according to Laboratory parameters.

S. No.	Parameter	Mean	SD
1.	RBS (mg/dl)	106.7	34.22
2.	Na ⁺ (mMol/L)	136.7	5.35
3.	K ⁺ (mMol/L)	3.86	0.53
4.	Cl ⁻ (mMol/L)	98.14	2.04
5.	UREA(mg/dl)	46.93	62.14
6.	CREATININE(mg/dl)	1.15	1.53
7.	S.NH ₃ (Umol/L)	25.5	30.13
8.	TLC (1000/cumm)	11.89	4.68
9.	S.PCT (ng/ml)	1.66	8.02
10.	PCO ₂ (mmHg)	51.32	25.14
11.	PO ₂ (mmHg)	74.26	6.09

Table 4: Distribution of patients according to Blood pressure.

S. No.	Blood Pressure	Mean	SD
1.	Systolic Blood Pressure	141.1	24.83
2.	Diastolic Blood Pressure	86.13	9.6

Table 5: Distribution of patients according to Comorbidity.

S. No.	Comorbidity	No. of Patients	Percentage
1.	HTN	71	47.33
2.	T2DM	34	22.66
3.	COPD	24	16
4.	No comorbidity	21	14
5.	ALD CLD PTHN	14	9.33
6.	CKD	6	4
7.	Dengue NS-1 Positive	3	2
8.	Psychiatric Disorder	3	2
9.	CLD PTHN (Autoimmune Hepatitis)	2	1.33
10.	Hypothyroidism T1DM	2	1.33
11.	CAD Post PTCA	1	0.66
12.	Carcinoma Lung On T/T(D/D)	1	0.66
13.	Intrauterine Fetal Death(D&C)	1	0.66
14.	Seizure Disorder	1	0.66
15.	K-Chest	1	0.66

Table 6: Distribution of patients according to Personal History.

S. No.	History	No. of Patients	Percentage
1.	Alcoholic	20	13.33333333
2.	Smoker	67	44.66666667
3.	Alcoholic, Non-Smoker	1	0.66666667
4.	Alcoholic, Smoker	19	12.66666667
5.	Smoker, Non-Alcoholic	48	32
6.	Non-Alcoholic, Non-Smoker	82	54.66666667

Table 7: Distribution of patients according to impression.

S. No.	Impression	No. of Patients	Percentage
1.	Neurological	79	52.66
2.	CO2 Narcosis	26	17.33
3.	Hepatic Encephalopathy	15	10.00
4.	Metabolic (Hypoglycemia)	8	5.33
5.	Metabolic (Hyponatrimia)	7	4.66
6.	Septic Encephalopathy	6	4.00
7.	Unknown Poisoning	6	4.00
8.	Uremic Encephalopathy	3	2.00

Table 8: Distribution of patients according to MRI Brain finding.

S. No.	MRI brain complete	No. of Patients	Percentage
1.	Normal MRI Scan	67	44.66666667
2.	CVA ICH	35	23.33333333
3.	CVA Infarct	26	17.33333333
4.	Hypoxic-Ischemic Brain Injury	6	4
5.	Cerebral Atrophy	4	2.666666667
6.	Viral Encephalitis	4	2.666666667
7.	Mass lesion	2	1.333333333
8.	Sub Archanoid Hemorrhage (SAH)	2	1.333333333
9.	Gliotic Sclerosis	1	0.666666667
10.	Acute Viral Cerebellities	1	0.666666667
11.	Acute Viral Meningoencephalitis	1	0.666666667
12.	Brain Metastasis	1	0.666666667

Table 9: Sub-Distribution of patients according to CVA ICH.

S. No.	CVA ICH (n=35)	No. of Patients	Percentage
1.	RT CG Region	10	29.41176
2.	LT CG Region with IVE	9	26.47059
3.	LT CG Region	5	14.70588
4.	RT CG Region with IVE	5	14.70588
5.	Pontine Area	2	5.882353
6.	B/L Cerebellum	1	2.941176
7.	RT Cerebellar Area	1	2.941176
8.	RT CG Region with IVE with Midline Shift	1	2.941176

Table 10: Sub-Distribution of patients according to CVA Infarct.

S. No.	CVA Infarct (n=26)	No. of Patients	Percentage
1.	Right MCA Territory	13	50
2.	Left MCA Territory	5	19.23
3.	Left ACA Territory	4	15.38
4.	Right ACA Territory	1	3.84
5.	Multiple	1	3.84
6.	Left Fronto- Pareito-Occipito Lobe	1	3.84
7.	Left Fronto- Pareito-Tempro-Occipital area	1	3.84

Discussion

Present observational cross-sectional analytical study showed clinical

presentation {according to Age [55.17±18.41], Gender [64% male and 36 % female], Laboratory parameters [RBS

(106.7 mg/dl), Na^+ (136.7 mMol/L), K^+ (3.86 mMol/L), Cl^- (98.14 mMol/L), UREA(46.93 mg/dl) and CREATININE (1.15 mg/dl), Clinical Parameter [S.NH₃ (25.5 Umol/L), TLC(11.89 1000/cumm), S.PCT (1.66 ng/ml), PCO₂ (51.32 mmHg) and PO₂ (74.26 mmHg)], Blood pressure (141.1/86.13 mmHg), Comorbidity [Hypertension (47.33%), ALD CLD PTHN (9.33%), T2DM (22.6%), COPD (16%), No comorbidity (14%) and other] and Personal History [44.66 % smoker and 13.33% alcoholic]}, neuroimaging (MRI Brain finding, CVA-ICH and CVA Inflect).

The mental status of a person is a combination of his level of consciousness and cognition and patients may have disorders of one or both.[4] Altered mental status is a major symptom of encephalopathy that refers to brain disease, damage, or malfunction. [5,6] It can present as a very broad spectrum of symptoms ranging from mild, such as some memory loss or subtle personality changes, to severe, such as dementia, seizures, coma, or death. Encephalopathy is thus characterized by an altered sensorium in the form of impairment of cognition, attention, orientation, sleep-wake cycle, and consciousness ranging from failure of selective attention to drowsiness. [7] Patient can present with myoclonus of asterixis (flapping tremor of the hands). [8]

We found that the majority (34%) of patients are found in the age group 41-60 years followed by 33.3% of 61-80 years age group. The mean age of our study group was 55.17 years. Our study was male dominant with 64% of the total population.

A similar study by Singh H et al [9] found that out of a total of 250 patients, 22.8 percent of the patients belonged to the age group of 51 to 60 years. 19.6 percent of the patients and 15.6 percent of the patients belonged to the age group of 41 to 50 years and 61 to 70 years respectively. 9.2

percent of the patients and 7.2 percent of the patients each belonged to the age group of 71 to 80 years, 11 to 20 years, and 21 to 30 years. Xiao HY et al, who reported similar findings in their study. [1] 1026 patients of their study were male (53.1%) and 908 female (46.9%); their age ranged from 14 to 97 years (average age 51.95 ± 15.71 years). Almost 701 patients were < 40 years (36.3%). Similar findings were also observed by Kanich W et al.⁶ The mean age of the study patients was 49 years with 57% male gender. A similar study by Naqash H et al⁴ divided study subjects into two groups: group A included patients of age up to 30 years and group B with patients in the age group 31-50 years. In group A, there were 42 patients or 37.5% (20 males and 22 females). In group B, there were 70 patients or 62.5% (30 males and 40 females). Thus, males comprised 44.64% and females 55.35% of subjects.

Mean systolic blood pressure was 141.1 and mean diastolic blood pressure was 86.13. A similar study by Kataja A et al [10] found that Systolic blood pressure (76 (12) vs. 80 (16) mmHg, $p = 0.03$) and left ventricular ejection fraction (LVEF) (32% (14) vs. 36% (14), $p = 0.05$) were lower in patients with altered mental status compared with those with normal mental status.

We found that the Mean serum Sodium of our study group was 136.7 mMol/L, mean RBS was 106.7 mg/dl. We found that the mean Potassium was 3.86 mMol/L. Mean Cl^- , urea and creatinine were 98.14 mMol/L, 46.93 mg/dl, and 1.15 mg/dl respectively. In our study mean S.NH₃, TLC, Serum PCT, PCO₂, and PO₂ was 25.5 Umol/L, 11.89 1000/cumm, 1.66 ng/ml, 51.32 mmHg, and 74.26 mmHg respectively.

We discussed the history of our study population. We found that 44.66 % and 13.33% of patients were smokers and alcoholics respectively. We illustrated comorbidity present in our study. We

found that Hypertension was present in 47.33% of patients followed by 9.33% of ALD/CLD/PHTN. Type-2 diabetes was found in 22.6% of patients followed by 16% and 14% of patients with COPD and No comorbidity patients respectively.

Naqash H et al [4] found that the most common comorbidities in studied patients were underlying seizure disorder (in 28 patients), psychiatric disease (in 9 patients) in the form of bipolar affective disorder or schizophrenia, hypertension (6 patients), type 2 diabetes (6 patients) and chronic kidney disease (6 patients). Other comorbidities included hypothyroidism (in 3), chronic liver disease (in 3), systemic lupus erythematosus (in 3), and 1 each of rheumatic heart disease, Sheehan's syndrome, metabolic syndrome, rheumatoid arthritis, ischemic heart disease, multiple myeloma, lung carcinoma, cerebral palsy with mental retardation, paroxysmal supraventricular tachycardia, type 1 diabetes, and post-splenectomy state. A study by KhuswahS et al [11] found that 62.5 % of the patients had one or more co-morbidities. The most common comorbidity was hypertension (HTN) in 25.8 % of patients followed by diabetes mellitus (DM) present in 21.7 % of the patients.

We found that 52.6 % of patients were showed neurological impressions followed by 17.3% of patients with CO₂ Narcosis. 10% and 5.3% of patients were of hepatic encephalopathy and metabolic impression in our study. The variety of pathogenic factors that cause several clinical manifestations of AMS results in significantly different clinical treatments. Therefore, determining the cause of AMS is very important. Currently, most emergency medicine literature focuses on the AMS subgroup such as comatose patients, whose coma state may have triggered AMS. Generally, the etiology of emergency AMS is categorized into two factors: primary nervous system and non-neurological factors. A recent study

considered neurological events to be the most important factors that cause AMS, and account for about 28% of AMS patients. [1] Despite the events in the nervous system as the most common reason for acute AMS, more than half of the AMS patients were caused by non-nervous system factors. In the elderly group, the top three causes of AMS were cerebrovascular disease, systemic and organic failure, and infection. In the non-elderly patients, the top three causes were drugs and toxic factors, systemic and organic failure, and metabolic and endocrine disorders. The non-neurological causes of AMS in the emergency department included drugs and substance intoxication, infection, metabolic endocrine abnormalities, trauma, cancer, and system/organ dysfunction. [12] Among these causes, acute alcoholism was considered to be the main factor out of AMS neurological causes.¹³ Neurological events as the most important factor that accounts for about 28% of altered mental status patients.¹ In A study conducted by Kanich W et al [6], the most common categories were neurologic (28%) followed by toxicologic (21%). Metabolic causes accounted for less than 5 percent of the cases. [9]

A study by Singh H et al [9] found that different authors from the past literature have reported different etiologic profiles of patients diagnosed with altered mental status in their studies. In a study conducted by Xiao HY et al, neurological causes (stroke, head trauma, or mass lesion) accounted for 35.0% (n=641), whereas 65.0% originated from non-neurological factors (n=1190). For the elderly group, the top three causes of AMS were cerebrovascular disease (36.2%), system and organ dysfunction (19.4%), and infection (10.4%). For the middle-aged and young groups, the top three causes were drugs or toxic factors (34.9%), system and organ dysfunction (11.1%),

and metabolic/endocrine factors (9.0%). [9]

We found that 23.33 % of patients were of CVA ICH followed by 17.33% of patients with CVA infarct. 4 % and 2.6 % were of Hypoxic-Ischemic Brain Injury and Cerebral Atrophy respectively. Viral Encephalitis and Sub Arachnoid Hemorrhage (SAH) were 2.6 % and 1.3 % respectively. The rest of the distribution was shown in table 10. We further classified CVA ICH. Here, we found that 29.4% of patients were of RT CG Region followed by 26.4% of patients of LT CG Region with IVE. 14.7% of patients were present with LT CG Region and RT CG Region with IVE each. We further distributed CVA Infarct founding. We found that 50% of patients were of Right MCA Territory followed by 19.23% of patients of Left MCA Territory. 15.38% of patients were diagnosed with Left ACA Territory. [13]

MRI may prove useful as a second-line test when occult pathology is suspected and initial head CTs are unrevealing, because of MRI's higher sensitivity in detecting ischemia, encephalitis, or subtle cases of SAH. Many of the abnormal findings in the literature for this topic included small ischemic infarcts. Notably, a retrospective study found that 70% of patients who had a missed ischemic stroke diagnosis presented with AMS. MRI of the brain is complementary to an abnormal head CT for evaluation of suspected intracranial mass lesions, intracranial infection, nonspecific regions of edema, ischemia, and cases of intracranial hemorrhage (ICH) when an underlying lesion is suspected. MRI may also be considered as a first-line test in certain situations, such as a clinically stable patient with known malignancy, HIV, or endocarditis. Noncontrast MRI examinations of the brain are usually sufficient in the assessment of intracranial complications related to hypertensive emergency, including posterior reversible

encephalopathy syndrome. Contrast-enhanced MRI examinations may be performed if intracranial infection, tumor, inflammatory lesions, or vascular pathologies are suspected. However, the literature search did not identify any studies regarding the use of contrast-enhanced MRI relevant to this variant. [14]

Cherukuri S K et al [3] used computerized tomography scanning of the brain as an investigative methodology in 28% of cases and most (94%) of them were abnormal. There are no specific guidelines for the efficient ordering of CT scans in AMS patients and a wide variation in its use exists. Our CT-head ordering rate was much lower than in other studies. Lim et al. 2009 found that 56.6% of their patients underwent CT of the brain at the ED and 39.1% were abnormal. This can be explained by the hospital and financial burden seen in India, forcing physicians to be rather judicious with the scans. [15]

Magnetic resonance imaging of the brain (brain MRI) and electroencephalography (EEG) is occasionally performed in patients with acute brain dysfunction including delirium, but their optimal role in the ED is yet to be determined. In addition, these diagnostic modalities may not be readily available in all settings further limiting their use. Patients with cerebrovascular accidents involving the right parietal lobe can present with delirium as the sole manifestation and without any focal neurological findings. [9]

Conclusion

At SMS Medical College, from assessed etiological diagnosis data of this study, we saw that 52.6% cases of neurological, 17.3% cases of CO₂ Narcosis, 10% cases of Hepatic Encephalopathy, 5.3% cases of Metabolic (Hypoglycemia), 4.66% cases of Metabolic (Hyponatrimia), 4.00% cases of Septic Encephalopathy, 4.00% cases of Unknown Poisoning and 2.00% cases of Uremic Encephalopathy.

Altered mental status is a common complaint in older ED patients. Acute changes are more concerning because they are usually caused by an underlying medical illness and can be life-threatening. The researchers hope their research will provide more clinical and etiological information on AMS, particularly in India.

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