ORIGINAL RESEARCH

Clinical profile of elderly patients presenting with altered mental status

[1] Archana Rao, [2] Jolly Daniel, [3] Medha Y. Rao

[1,2,3] Department of General Medicine, M.S. Ramaiah Medical College, Bengaluru, India

Corresponding author
Dr. Jolly Daniel
Department of General Medicine, M.S. Ramaiah Medical College, Bengaluru, India

ABSTRACT
Background: The geriatric age group, defined as any individual above the age of 60 years, is expected to double from 7.7% in 2001 to 12.30% in 2025.,[1] Altered mental status is a challenging entity, where atypical manifestations poses greater challenge for diagnosis and treatment
Aims: To analyze the clinical profile and etiology of elderly patients presenting with altered mental status A prospective, descriptive study of 247 elderly patients who presented with altered mental status were admitted to the wards/ICU. Detailed history was obtained from the attender, including comorbid conditions, activities of daily living, polypharmacy, physical disabilities. Comprehensive geriatric assessment, MMSE, GCS was performed and documented. Laboratory, radiological and other investigations were reviewed in order to make a conclusive diagnosis and care plan and patients were followed up, until discharge from the hospital
Results: 247 elderly patients were included with a mean age was 71 years out of which 86.4% had comorbidities and 14.17% had psychiatric illness. 37% consumed alcohol and 33.19% were on medication with probable cause delirium. (78.3%). The mean GCs was 9.68. The most common etiology were metabolic disturbances (60.7%), followed by septic etiology (30.7%), cerebrovascular disease (12.55%), delirium (10%) The mortality rate in this study was 13.9%
Conclusion: Majority patients had one or more comorbid conditions, drowsiness being the most common (68.01%). 14.5% had focal neurological deficits. Metabolic and septic encephalopathy were the most common. 20.6% had multiple causes of altered mental status. Septic encephalopathy with a worst outcome (23.07%) deaths.80.5% of patients were discharged.
Key words: [Altered mental status, Encephalopathy, Septic, Metabolic, delirium, Cerebrovascular accident, Glascow coma scale]

BACKGROUND
Altered mental status is a blanket term which is frequently encountered scenario of brain dysfunction ranging from delirium to coma.[2] It accounts for 10% of emergency visits annually.[3,4] out of which 41-60% are elderly. Diagnosis in younger patients is, toxicological or organ specific.[5] where as in elderly its More of like needle in a haystack, with high mortality rates.[6-8] hence the urgency in diagnosis. In elderly it is largely ranges from encephalopathy to delirium.[9] Encephalopathy is defined as global alteration of brain function due to underlying physiological or systemic derangement .Delirium is an acute disturbance in attention an awareness, that tends to fluctuate in severity, and maybe accompanied by

disturbance in cognition or thought process, as a result of underlying medical condition ,which cannot be explained .[10,11] It is often a serious but reversible disorder that affects around 50% of the elderly population. There are over 24 delirium assessment tools, the most commonly used being Confusion Assessment Method or CAM. (available in 12 languages). There are different versions that have been adapted for ICU/ED/nursing home use.[12]

SAMPLE FRAME
Prospective, descriptive study from a period of October 2018 to September 2020 of all elderly patients admitted in Ramaiah Hospitals with altered mental status.

METHODOLOGY
• Demographic data and a detailed history, including a history of head trauma, drug abuse, seizures, comorbid conditions, regular medications and physical limitations was taken from the informant. Comprehensive geriatric health assessment including general physical examination, systemic examination, neurologic examination was performed.
• Patients were investigated and managed as per treating physician's protocol. Data thus collected was analyzed

RECRUITMENT METHODS
INCLUSION CRITERIA
Elderly men and women, above the age of 60 years, presenting with altered mental status determined by any one of the following: positive Confusion Assessment Method- ICU test, Glasgow Coma Scale score of less than 15, diminished alertness, disorientation with respect to time, place, person, difficulty in arousal, diminished responsiveness to verbal stimuli, agitation, hallucinations, were included in this study.
Exclusion Criteria:
1. Elderly patients with history of pre-existing cognitive deficits, such as dementia were excluded.

SAMPLE SIZE CALCULATION
247 subjects from the literature review, Khurana et al. study has observed that the most common etiological factors for delirium were sepsis (36.5%) and metabolic abnormalities (35%).[15]
In the present study, expecting similar results, with 95% confidence level and 17% relative precision, the study requires a minimum of 247 subjects.
$SS = Z2 * (p) * (1-p)C2$

STATICALLY ANALYSIS
Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. Chi-square test or Fischer's exact test(for 2x2 tables only) was used as test of significance for qualitative data.
Graphical representation of data: MS Excel and MS word was used to obtain various types of graphs
P value (Probability that the result is true) of <0.05 was considered as statistically significant after assuming all the rules of statistical tests. Statistical software: MS Excel, SPSS version 22 (IBM SPSS Statistics, Somers NY, USA) was used to analyze data.

RESULTS

247 elderly patients with altered mental status were admitted and out of which 76 women (30.8%) and 171 men (69.2%) and the male to female ratio was 2.24:1 showing male predominance, except in the 90-99 years sub-group.

Sex	frequency	Percent %
Female	76	30.8
Male	171	69.2
Total	247	100.0
Table Distribution of subjects according to sex		

According to presentation of altered mental status, patients were classified as having decreased responsiveness (68.01%), isorientation (29.95%), agitation (52,21.05%), inappropriate behaviour (9.71%) and hallucinations (4.85%), in decreasing order of frequency

	N	%
Drowsy /unresponsive	168	68.01
Agitation	52	21.05
Disorientation	74	29.95
Inappropriate behaviour	24	9.71
Hallucinations	12	4.85
Table 2: Showing distribution of subjects according to presentation		

24 (10%) of the patients were found to be in delirium, detected by a positive CAM ICU test. Among them, the hypoactive type (79%) predominated over the hyperactive (16%) and mixed types(5%).

Type of delirium	N	%
Hypoactive	19	79
Hyperactive	4	16
Mixed	1	5
Table 3: Table showing distribution of subjects according to type of delirium		

History regarding, trauma, seizures and other Comorbid conditions which was about 15.3%, 10.1% and 84.6% respectively.

	Frequency	Percent (%)
None	38	15.4
T2DM	119	48.2
Hypertension	72	29.14
Seizure disorder	2	0.8
IHD	21	8.5
CVA	9	3.6
CKD	12	4.8
CLD	10	4.0
Copd	7	2.8
Malignancy	4	1.6

Old TB	1	0.4
AF	7	2.8
Hypothyroidism	16	6.4
Hyperthyroidism	2	0.8
BA	2	0.8
RA	2	0.8
RHD	1	0.4
Psoriasis	1	0.4
Table 4:Frequency distribution of comorbidities among the subjects		

Alcohol consumption was present in 37% of the subjects. Other drugs known to be associated with delirium was being taken by 82 patients (33.19%).

Significant Drug History	Frequency	Percent %
None	165	66.8
Benzodiazepines	30	12.15
Beta blockers	15	6.07
NSAIDS	11	4.45
TCA	10	4.05
Lithium	1	0.4
Barbiturates	2	0.81
Atypical antipssychotics	4	1.62
Opiods	5	2.02
Digoxin	2	0.81
Steroids	2	0.81
Total	247	100.0
Table 5 :-Showing distribution of significant drugs associated with delirium, according to class		

Vital parameters were as follows.
Tachycardia noted in 54 patients (21.8%), bradycardia in 16(6.4%) with mean heart rate of 85.5, Hypertension was observed in 46 patients (18.6%), hypotension in 12 (4.85%) with a Mean systolic and diastolic blood pressures were 127.04 and 75.85 mmHg respectively. Tachypnoea was present in 71 patients, (28.7%) and hypoxia was seen in 40 patients (16.19%). 52 patients (21.05%) had fever (temperature of 99F and above).
Patients with focal neurological deficits (14.5%), signs of raised ICP (such as papilledema, irritability, cranial nerve palsies) 6.07% and meningism (4.04%). Focal neurological deficits(14.5%) included hemiparesis(69.4%), aphasias (55.5%), asymmetric pupils(40%), cranial nerve palsies(27.7%) and hemiplegia(14%). Mean GCS at admission was 9.68. 26% required intubation at admission.

	Freqyueny	Percent%
<=8	61	24.7
>8	186	75.3
Total	247	100.0
Table 6:- Distribution according to GCS, above or below 8.		

Supplementary laboratory parameters which can further decrease alertness .Anemia seen in (18%), vitamin B12 deficiency(. 24%), metabolic acidosis (28.3%). type 1 respiratory failure (8.09%), type 2 respiratory failure (2.8%), and mixed acidosis(1.6%), in order of decreasing frequency. Neuroimaging finding contributing to altered mental status.

MRI/CT Brain	Frequency	Percent%
None	49	19.8
CSVD	62	25.1
Age related	87	35.2
Infarct	26	10.5
Bleed	18	7.2
Space occupying lesion	5	2
Others	11	4.4
Table 7:-Frequency Distribution of MRI/CT Brain finding among the subjects		

Abnormal Chest X-rays findings were abnormal in 20% of patients.

Findings included pulmonary edema, lung consolidation, infiltrates-bilateral, unilateral and miliary infiltrates which probably can contribute to hypoxia.

	Frequency	Percent%
Normal	197	79.76
Abnormal	50	20.24
Total	247	100.0
Table 8:- Distribution of subjects according to chest x-ray		

USG was grossly abnormal in 50 patients, revealing shrunken kidneys (24%), significant prostatemegaly (16%), cystitis(12%), pyelonephritis(2%) and sub-acute, intestinal obstruction(1.2%).
EEG was done in 18 patents and the most common finding

EEG	Frequency	Percent %
None	229	92.7
Slowingof background waves	13	2.4
Normal	3	1.2
Spike wave pattern	2	8
total	247	100
Table 9:- Distribution of subjects according to EEG was slowing of background waves		

LP CSF, similarly, was performed in those in whom meningitis/encephalitis was suspected or in whom reaching a diagnosis was challenging, yielding positive results in 20 patients.

Type of neuro infection	Frquency	Percent%
Meningitis	15	75
Encephalitis	5	25
Table 10:– Distribution of type of neuro-infection		

Cultures were positive in 30% of patients with septic encephalopathy of which urine was (38.1%) ,blood(23.6%) and both blood and urine cultures positive in 10.9%. commonest organism was E.coli (52.7%).

Among the diagnosis, common was metabolic encephalopathy (150,60.7%), septic encephalopathy (76, 30.7%), cerebrovascular disease (12.55%), neuro-infection (8.09%), drug induced (4.4%) and lastly seizures (4.04%).

	Frequency	Percent%
Metabolic	150	60.7
Sepsis	76	30.7
CVA	31	12.55
Neuro-infection	20	8.09
Drugs	11	4.45
GTCS	10	4.04
Table 11:- Distribution of subjects according to Diagnosis		

Among metabolic encephalopathy, the diagnosis in decreasing order of incidence were as follows

Hyponatremia	30	20
Hepatic encephalopathy	25	16.67
Hypoglycemia	22	14.67
Hypercapnoea	15	10
Hyperglycemia	14	9.3
Uremia	14	9.3
Hypernatremia	12	8
Cardiovascular	10	6.67
Hypercalcemia I	5	3.33
Hypocortisolism	3	2
Table 12:- Distribution of subjects according to type of metabolic abnormality		

Among septic encephalopathy, the source was most common urosepsis 39% then community acquired pneumonia (CAP), 30% other infections such as cellulitis, diabetic foot or acute gastro enteritis make up 30%. Cerebrovascular disease was most common cause and was about 12.55%, of which Acute bleeds were (52%) and acute infarcts (48%). 20.6% of patients had multiple etiology. The most common combination were Septic and Metabolic encephalopathy. Urosepsis with hyponatremia, Sepsis with recurrent hypoglycemia, CKD with Dyselectrolytemia, followed by CVA with metabolic derangement. 81% of patients were discharged. 13% of patients succumbed to their illnesses and 6% were discharged against medical advice. Higher mortality was seen in CVA group (24.1%), followed by septic encephalopathy (23.07%) and metabolic encephalopathy (8.8%).

Outcome	Frequency	Percent%
Discharge	200	81.0
Death	33	13.4
DAMA	14	5.7
Total	247	100.0
Table 13:-Distribution of subjects according to Outcome		

	Study title	Most 1st	Common 2nd	Etiology 3rd
Our study	Clinical profiling of elderly Patient presenting with altered sensorium	Metabolic	Septic	CVA
Khurana et al	Evaluation of delirium in elderly : a hospital based study	Sepsis and infection	Metabolic abnormalities	CVA
Aslaner et aL	Etiologies and delirium rates of elderly ED patients with acutely altered mental status :A multi center prospective study	Infection	Neurological disease	Metabolic
Kanich et al	Altered mental status : evaluation and etiology in ED	Neurologic	Toxicologic	Trauma /psychiatric

Table: 14- showing top 3 etiology of altered mental status in various studies:

Figures and Tables
All the criteria should be met-

1. Disturbance in attention and awareness
2. Disturbance develops acutely and tends to fluctuate in severity
3. At least one additional disturbance in cognition
4. Disturbances are not better explained by pre-existing dementia
5. Disturbances do not occur in the context of a severely reduced level of
6. Arousal/coma
7. Evidence of underlying organic cause/causes
Table :15 DSM V criteria[11]

1. Acute change in mental status with a fluctuating course
2. Inattention
3. Altered level of consciousness
4. Disorganised thinking
Table :16- Confusion Assessment Method

The presence of delirium requires features 1 and 2 and either 3 or 4:

Behaviour	Response		Score
Eye opening	✔	Spontaneously	3
	✔	To speech	2
	✔	To pain	1
	✔	No response	0

Best verbal response	✔ Oriented to time, place, person ✔ Confused ✔ Inappropriate words ✔ Incomprehensible sounds ✔ No response	4 3 2 1 0
Best motor response	✔ Obeys commands ✔ Moves to localised pain ✔ Flexion withdrawal from pain ✔ Abnormal flexion (decorticate) ✔ Abnormal extension ✔ No response	6 5 4 3 2 1 0
Total score	✔ Best response ✔ Comatose ✔ Totally unresponsive	15 <8 3

Table :17 Glasscow coma scale

Score	Description	
+4	Combative	Violent, immediate danger to staff
	Very agitated	Pulls at/removes tubes, aggressive
+2	Agitated	Frequent non-purposeful movements, fights ventilator
+1	Restless	Anxious, apprehensive but movements not aggressive/vigorous
0	Alert and calm	
-1	Drowsy	Not fully alert, sustained awakening to voice (eye-opening & contact > 10 sec)
-2	Light sedation	Briefly awakens to voice (eye-opening & contact <10 sec)
-3	Moderate sedation	Movement or eye-opening to voice (no eye contact)
-4	Deep sedation	No response to voice, but movement or eye opening to physical stimulation
-5	Unarousable	No response to voice or physical stimulation
Table 18-RASS score (Richmond Agitation and Sedation Scale)		

DISCUSSION

Altered mental status a common complaint encountered as OPD and emergency basis where elderly is about 5-10% [4]. Behavioural changes like sometimes can be the prominent symptom which interferes in activities of daily living [13] In our study of 247 elderly patients with a mean age of 71 yrs .The mean age in Khurana et al. study was 70.8 years 95 and in Aslaner et al. and Han et al. were 72 and 74 years respectively.[5,16.] Majority of patients fall into young -old category (60-69), with a male predominance (69.2%).similar pattern was observed intwo other Indian studies conducted by Khurana et al. in Varanasi and Sreejith et al. in Bangalore.[4,8,17.] A possible explanation include, the socioeconomic and cultural factors

whereby males are more likely to be hospitalized for the same illness than females, second being that male sex has been established as a predisposing factor for delirium.[13] Comorbid information regarding all patients was collected from the informant, 84.5% of patients had at least one comorbid condition and type 2 diabetes was most common. 10.93% had multiple comorbid conditions making them prone to polypharmacy. Study done by Han et al., hearing impairment was independently associated with delirium.[16] Immobility with varying cause in elderly patients associated to delirium.[18,19] In our study, the most common causes of altered mental status were metabolic and septic and cerebrovascular accident encephalopathy, 60.7% ,30.7% and 12.55% respectively. Among the metabolic cause hyponatremia (22%), hepatic encephalopathy (19%) and hypoglycemia (16%). Similar distribution of etiology was noted in a study conducted by Venkatesh et al. in JSS Hospital Mysore, with hypoglycemia, hyponatremia and hepatic encephalopathy.[14] In our country other decreasing order of frequency were, hypercapnoea, hypernatremia, hyperglycemia, uremia, cardiovascular causes, hypercalcemia and hypocortisolism.

In septic encephalopathy, urinary tract infections (39%) and community acquired pneumonia (30%) were the most common. A study conducted by Aslaner et al, where UTI and pneumonia were among the most common diagnoses overall[5]. Among the altered mental status Cerebrovascular disease accounts for 12.55% cases out of acute hemorrhagic strokes (52%) than acute infarcts (48%). In a study conducted by Ojaghihaghighi et al., It was observed that agitation was prevalent among 79.9% of hemorrhagic stroke patients, whereas it was only 6.7% in those with ischemic stroke.[21] Neuro-infection included meningitis (75%) and encephalitis (25%), of which Tuberculous etiology (46.6%) was most commonly observed in this study, followed by viral (40%) and bacterial (13.3%).Drugs and intoxication included alcohol withdrawal/intoxication, benzodiazepine overdose (4.45%) case. The multifactorial nature of altered mental status with multiple etiology (20.6%). A similar result was seen in two studies by Aslaner et al (19.3%) and another study by conducted by Khurana et al,.[5,15] Delirium was detected in 10% of the patients using the CAM ICU score when compared to other studies conducted by Han et al. (8.3%) and Hustey et al. (7%) in patients presenting with altered mental status in the ED.[16,20] The hypoactive type was predominantly noted (79%) and seen in many studies conducted by those by Marcantonio ER et al. and Yang et al.[22,25] Indian study done by Khurana et al had a similar pattern with 65% cases being the hypoactive variety.[15] 81% patients were successfully treated and discharged, 5.7% were discharged against medical advice and 13.4% succumbed to their illness comparing to the mortality rates of other similar studies conducted varied from 9-23.9%.[23, 24, 25]

CONCLUSION

In conclusion, altered mental status is a broad diagnosis with an even broader spectrum of causes, including several reversible causes. It
occurs quite frequently in the vulnerable elderly population and if left untreated, it could result in
higher rates of mortality. Hence, altered mental status must be viewed with a high index of suspicion and approached as an emergency

REFERENCES

1. Das SK. Geriatric neurology – A burgeoning social issue. J Indian Med Assoc 2005;103:131, 144
2. Sekhon N, Moukaddam N, TucciV. Like a Modern Day, Sherlock Holmes:Diagnosing and Differentiating the Etiology of Altered Mental Status. Madridge J. DOI:10.18689/mjiem-1000104
3. Intern Emerg Med. 2017; 1(1): 14-24.

4. Kanich W, Brady WJ, Huff JS, et al. Altered mental status: evaluation and etiology in the ED. Am J Emerg Med. 2002; 20(7): 613-17. doi: 10.1053/ajem.2002.35464

5. Douglas VC, Josephson SA. Altered mental status. Continuum (MinneapMinn).2011; 17(5 Neurologic Consultation in the Hospital): 967-83. doi: 10.1212/01.CON.0000407055.17661.33.

6. Aslaner MA , Boz M, Celik A, et al .Etiologies and Delirium Rates of Elderly ED Patients with

7. Acutely Altered Mental Status: A Multicenter Prospective Study, American Journal of Emergency Medicine (2016). 2017, Jan1;35(1):71-76. doi10.1016/j.ajem.2016.10.004

8. Kekec Z, Senol V, Koc F, et al . Analysis of altered mental status in Turkey. Int J Neurosci. 2008;118(5):609-17.DOI: 10.1080/00207450701849133

9. Xiao HY, Wang YX, Xu T.D, , et al. Evaluation and treatment of altered mental status patients in the emergency department: Life in the fast lane. World J Emerg Med. 2012;3(4):270-7. DOI: 10.5847/wjem.j.issn.1920-8642.2012.04.006

10. Leong LB, Jian KH, Vasu A, et al . Prospective study of patients with altered mental status: clinical features and outcome. Int J Emerg Med.2008;1(3):179-82. DOI: 10.1007/s12245-008-0049-8

11. Behrouz R, Godoy DA., Azarpazhooh MR , et al Altered mental status in the neurocritical care

12. unit, Journal of Critical Care (2015). DOI: 10.1016/j.jcrc.2015.07.021

13. Narrow WE ,Blazer DG, Burke Jr JD et al ,American Psychiatric Association. Diagnostic and statistical manual of mental disorders, 5th ed. Washington, DC: American Psychiatric Association 2013.doi.org/10.1176/appi.books.9780890425596

14. WHO. The ICD-10 classification of mental and behavioural disorders: diagnostic criteria for research. Geneva: World Health Organization, 1993

15. Inouye SK, Westendorp RGJ, Saczynski JS. Delirium in elderly people. Lancet. 2014;383(9920):911-22. doi: 10.1016/S0140-6736(13)60688-1.

16. Mendez MF, Padilla CR. Delirium. Bradley's textbook of Neurology 7th ed. USA: Elsevier Inc; 2016. p.23-33

17. Venkatesh CR, Kiran HS, Murthy KA, et al. Clinical Profile of Atypical Manifestations of Diseases in Elderly Patients Admitted to Critical Care Areas. International journal of scientific study. 2015 Oct 1;3(7):254-8.

18. Khurana V, Gambhir IS, Kishore D. Evaluation of delirium in elderly: A hospital-based study. Geriatrics & gerontology international. 2011 Oct;11(4):467-73. doi: 10.1111/j.1447-0594.2011.00710.x.

19. Han JH, Zimmerman EE, Cutler N, et al . Delirium in older emergency department patients: recognition, risk factors, and psychomotor subtypes. Academic Emergency Medicine. 2009Mar;16(3):193-200. DOI: 10.1111/j.1553-2712.2008.00339.x

20. Va SP, Mathew B. A study of delirium in hospitalized elderly with emphasis on risk factors. The Journal of the Association of Physicians of India. 2016 Jan;64(1):106.

21. Iolascon G, Cervone M, Gimigliano R, et al Neuropsychiatric disorders in hip fracture. Clinical cases in mineral and bone metabolism. 2011 Sep;8(3):49-53

22. Kyziridis TC. Post-operative delirium after hip fracture treatment-a review of the current literature. GMS Psycho-Social Medicine. 2006;3

23. Hustey FM, Meldon SW, Smith MD, et al . The effect of mental status screening on the care of elderly emergency department patients. Ann Emerg Med. 2003; 41(5): 678-684. DOI: 10.1067/mem.2003.152103.

24. Ojaghihaghighi S, Vahdati SS, Sorkhabi R, et al. Comparison of neurological clinical

25. manifestation in patients with hemorrhagic and ischemic stroke. World journal of

26. emergency medicine vol. 8,1 (2017): 34-38. doi: 10.5847/wjem.j.1920-8642.2017.01.006

27. Marcantonio ER. Delirium. Annals of internal medicine. 2011 Jun 7;154(11):ITC6-1. Doi.org/10.7326/0003-4819-154-11-201106070-01006

28. Inouye SK. Delirium in hospitalized older patients: recognition and risk factors. J Geriatr Psychiatry Neurol 1998; 11:118–125. doi: 10.1177/089198879801100302.

29. Navinés R, Gómez E, Franco JG, de Pablo J. Delirium in a consultation-liaison psychiatry unit of a general hospital. Actas Esp Psiquiatr 2001; 29: 159–164.

30. Yang FM ,Marcantonio ER, Inouye SK et al. Phenomenological subtypes of delirium in older persons: patterns, prevalence, and prognosis. Psychosomatics 2009 May-Jun;50(3):248-54.

31. doi: 10.1176/appi.psy.50.3.248.