Journal of Carcinogenesis
Covering Genesis to Therapeutics

Journal of Carcinogenesis, ISSN: 1477-3163
2025; Vol 24: Issue 3, https://carcinogenesis.com/

Pharmacoepidemiological study in patients with non-traumatic altered sensorium at tertiary care hospital

Abhishek Anand[1], Md Ashif1, Shoeab Ahamad[1], Mithul V Mammen[1], Amit Kumar[2]*, Deepanshu Siwach[3], Mannu kumar[4]

[1]Department of Pharmacy Practice, Teerthanker Mahaveer College of Pharmacy, Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India -244001

[2]Department Of Pharmacology, Shri Venkateshwara School of Pharmacy, Shri Venkateshwara University, Rajabpur, Gajraula, Amroha, Uttar Pradesh, India

[3]PGDM (Hospital and Health Management), International Institute of Health Management Research, New Delhi

[4]Department of Pharmacology, The sanskar valley school of healthcare sciences, Mirdadpur ,Guraru , Gaya- 824118

Corresponding author:

Amit Kumar* , E-mail ID: amittph1812017@gmail.com

Address: Department Of Pharmacology, Shri Venkateshwara school of Pharmacy, Shri Venkateshwara University, Rajabpur, Gajraula, Amroha, Uttar Pradesh, India

ABSTRACT

Background: Non-traumatic altered sensorium (NTAS) is a critical condition with diverse etiologies, presenting significant diagnostic and therapeutic challenges, particularly in resource-limited settings.

Objective: To evaluate the clinical features, etiologies, drug utilization patterns, and treatment outcomes of NTAS in a tertiary care hospital.

Methods: This six-month prospective observational study at Teerthanker Mahaveer Hospital, Moradabad, India, enrolled 272 patients aged >18 years with NTAS lasting >4 hours, excluding those with transient unresponsiveness or pre-existing cognitive disorders. Data on demographics, clinical characteristics, diagnostic investigations, etiologies, and outcomes were analyzed.

Results: The cohort (52.2% male, 47.8% female; 60% urban, 40% rural) was primarily aged 18–45 years. Metabolic disorders were the most common etiology, followed by infections, CNS disorders, and drug-induced causes. Sepsis presented severe symptoms (85% confusion, 70% lethargy), while metabolic and drug-induced cases were milder. Blood glucose testing (77.2%) and neuroimaging (CT: 47.8%, MRI: 43.4%) were frequent, but EEG use was low (6.6%). Polypharmacy was prevalent (40.07% on 4–6 drugs), increasing adverse drug reaction risks. Recovery rates were highest for withdrawal cases (98%) and lowest for sepsis (50% recovery, 30% mortality).

Conclusion: Effective NTAS management requires early diagnosis, etiology-specific treatments, and pharmacovigilance. Limited EEG use and high polypharmacy underscore the need for enhanced diagnostics and rational prescribing to improve outcomes in resource-constrained settings.

Keywords: *Non-traumatic altered sensorium, delirium, polypharmacy, etiology, pharmacovigilance, tertiary care*

How to Cite: Abhishek Anand, Md Ashif1, Shoeab Ahamad, Mithul V Mammen, Amit Kumar, Deepanshu Siwach, Mannu kumar, (2025) Pharmacoepidemiological study in patients with non-traumatic altered sensorium at tertiary care hospital, *Journal of Carcinogenesis, Vol.24, No.3*, 319-326.

1. INTRODUCTION

Non-traumatic altered sensorium (NTAS) is a critical clinical condition characterized by impaired consciousness, cognition, or awareness, often serving as a sentinel sign of severe underlying pathologies. Unlike traumatic causes, NTAS arises from metabolic, infectious, neurological, or pharmacological etiologies, presenting significant diagnostic and

therapeutic challenges in emergency departments (EDs), intensive care units (ICUs), and general medical wards [1]. The condition manifests as a spectrum of symptoms ranging from mild disorientation to profound coma, with clinical presentations varying based on the underlying cause [2]. Approximately 5–10% of adult ED visits involve altered mental status (AMS), with NTAS being a major contributor, particularly in older adults where inpatient delirium affects 10–23% of general medical admissions, 15–50% of postoperative patients, and up to 85% of ICU patients [3]. These figures underscore the significant morbidity and mortality associated with NTAS, with studies reporting a mortality rate of approximately 10% in hospitalized patients [4].

The etiology of NTAS is multifactorial, involving metabolic disturbances (e.g., hypoglycemia, hyponatremia, hepatic or uremic encephalopathy), central nervous system (CNS) infections (e.g., meningitis, encephalitis), stroke, sepsis, and drug-induced conditions such as alcohol withdrawal or overdose [5]. These causes disrupt normal brain function through mechanisms like neurotransmitter imbalance, toxic accumulation, hypoxia, ischemia, or inflammation, leading to impaired arousal and consciousness [6]. Risk factors include advanced age, comorbidities (e.g., diabetes mellitus, hypertension, renal or hepatic disease), polypharmacy, and environmental factors such as sleep deprivation or ICU stays [7]. The diagnostic approach to NTAS is complex due to its non-specific presentation, requiring a combination of clinical history, physical examination, laboratory tests (e.g., complete blood count, electrolytes, glucose), neuroimaging (e.g., CT, MRI), and specialized tests like electroencephalography (EEG) or lumbar puncture [8]. Challenges such as overlapping etiologies, time constraints, and limited access to advanced diagnostics in resource-constrained settings further complicate timely and accurate diagnosis [9].

Pharmacological agents play a dual role in NTAS, both as potential contributors and therapeutic tools. Medications such as benzodiazepines, antipsychotics, opioids, and corticosteroids can precipitate NTAS through CNS depression, anticholinergic effects, or serotonin syndrome, particularly in the elderly or those with polypharmacy [10]. Conversely, targeted pharmacological interventions, such as dextrose for hypoglycemia or antibiotics for infections, are critical for addressing underlying causes [11]. Non-pharmacological strategies, including environmental modifications and cognitive stimulation, also play a vital role in managing and preventing NTAS, particularly in delirium cases [12]. The high prevalence of polypharmacy and drug-drug interactions (DDIs) in NTAS patients necessitates robust pharmacoepidemiological surveillance to optimize therapeutic outcomes and minimize adverse drug reactions (ADRs) [13].

This study aims to investigate the clinical features, etiologies, drug utilization patterns, and treatment outcomes of NTAS in a tertiary care hospital setting. By analyzing demographic profiles, clinical presentations, and pharmacological interventions, the research seeks to address gaps in the literature, particularly in resource-limited settings, and contribute to evidence-based clinical guidelines for NTAS management. The findings are expected to enhance early diagnosis, rational prescribing, and multidisciplinary care, ultimately improving patient outcomes and reducing the healthcare burden associated with this complex condition.

2. METHODOLOGY

This prospective, observational study was conducted over a six-month period in the General Medicine Department at Teerthanker Mahaveer Hospital, a tertiary care facility located at Bagarpur, Delhi Road, Moradabad, 244001. A systematic protocol was followed to obtain approval from the Institutional Ethical Committee, with all required documents submitted. The study received approval from the Institutional Ethical Committee (TMU/IEC/2024-25/ PG/ 012).

The study includes patients over 18 years of age presenting with altered sensorium lasting more than 4 hours due to non-traumatic causes, who are willing to participate and available for follow-up at the study facility. Patients with transient unresponsiveness due to syncope or hysteria, severe cognitive impairment, or pre-existing cognitive disorders such as Parkinson's disease are excluded from the study.

3. RESULT AND DISCUSSION

The study evaluated the clinical features, causes, and management of non-traumatic altered sensorium in 272 patients at a tertiary care hospital. The following sections present the key findings based on demographic distribution, clinical characteristics, diagnostic investigations, etiological factors, treatment outcomes, hospital stay, and medication usage.

3.1 Demographic Distribution

The demographic profile of the 272 patients revealed a balanced distribution across urban and rural settings, marital status, and gender, with slight variations across age groups. The majority of patients were aged 18–45 years, with consistent proportions of urban (60%) and rural (40%) residency across most age groups. Most patients were married (69.9%), and the gender distribution was nearly equal (52.2% male, 47.8% female).

Table 1 Demographic distribution

Age Group (Years)	No. of Patients (n)	Urban (n, %)	Rural (n, %)	Married (n, %)	Unmarried (n, %)	Male (n, %)	Female
18–30	72	43(59.7)	29(40.3)	50(69.4)	22(30.6)	39(54.2)	33(25.38)
31–45	90	54(60)	36(40)	63(70)	27(30.6)	51(56.7)	39(30)
46–60	55	33(60)	22(40)	39(70)	16(29.1)	23(41.8)	32(32)
61–75	55	33(60)	22(40)	38(69.1)	17(30.9)	29(52.7)	26(20)
Total	**272**	**163(59.9)**	**109(40)**	**190(69.9)**	**82(30.1)**	**142(52.2)**	**130(47.8)**

3.2 Clinical Characteristics

Clinical features varied significantly by disease category, with metabolic, infectious, CNS-related, and drug-induced causes showing distinct patterns in systolic blood pressure (BP), heart rate, and neurological symptoms (confusion and lethargy).

Table 2 Clinical characteristics

Disease Category	Specific Disease	Mean Systolic BP ± SD	Mean Heart Rate ± SD	% with Confusion	% with Lethargy
Metabolic	Diabetes Mellitus	140 ± 20	92 ± 10	65%	50%
Metabolic	Thyroid Disorder	135 ± 18	88 ± 8	55%	40%
Metabolic	Electrolyte Imbalance	130 ± 22	100 ± 12	70%	60%
Infectious	CNS Infection	125 ± 25	102 ± 14	75%	65%
Infectious	Wound Infection	138 ± 17	86 ± 9	40%	30%
Infectious	Sepsis	110 ± 30	110 ± 20	85%	70%
CNS Causes	Stroke	145 ± 25	90 ± 10	80%	75%
CNS Causes	Seizure	140 ± 15	85 ± 7	50%	40%
Drug-induced	Overdose	118 ± 20	105 ± 18	60%	55%
Drug-induced	Withdrawal	130 ± 15	95 ± 10	55%	45%

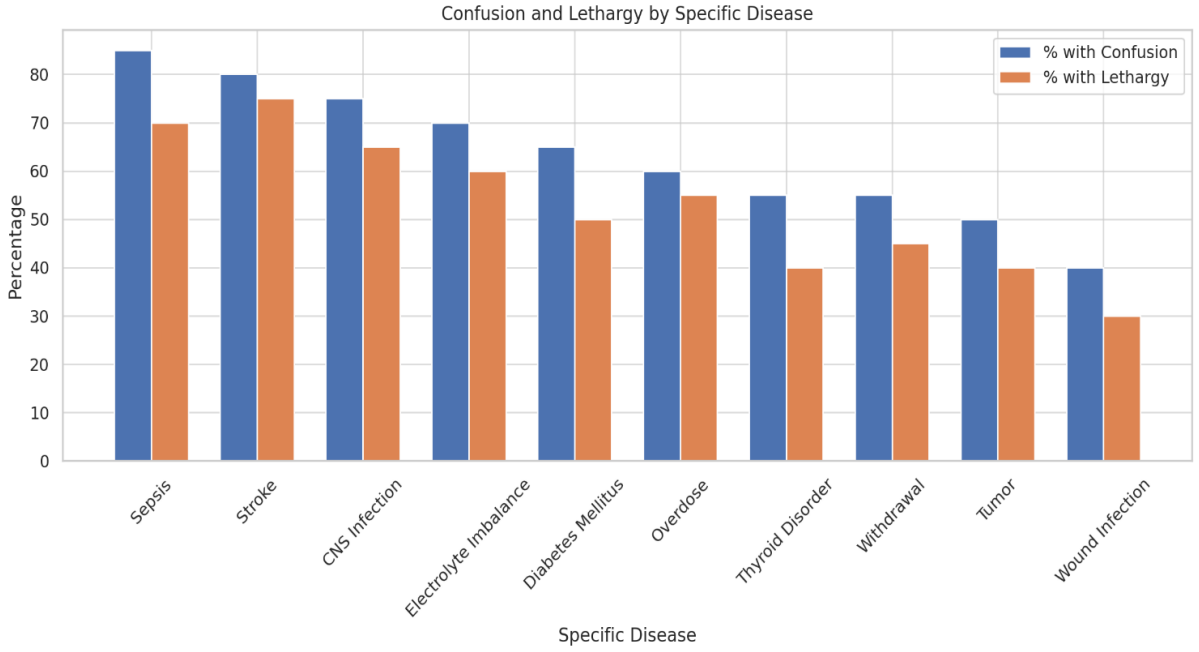

Figure 2 Confusion and Lethargy by Specific Disease

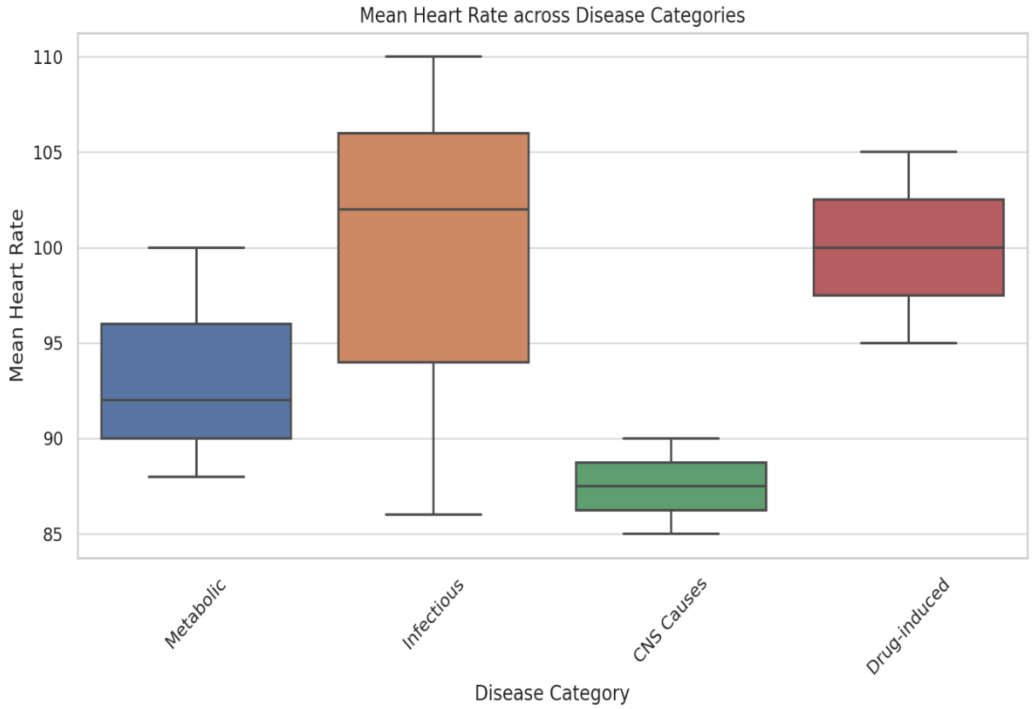

Figure 3 Mean Heart rate across disease characteristics

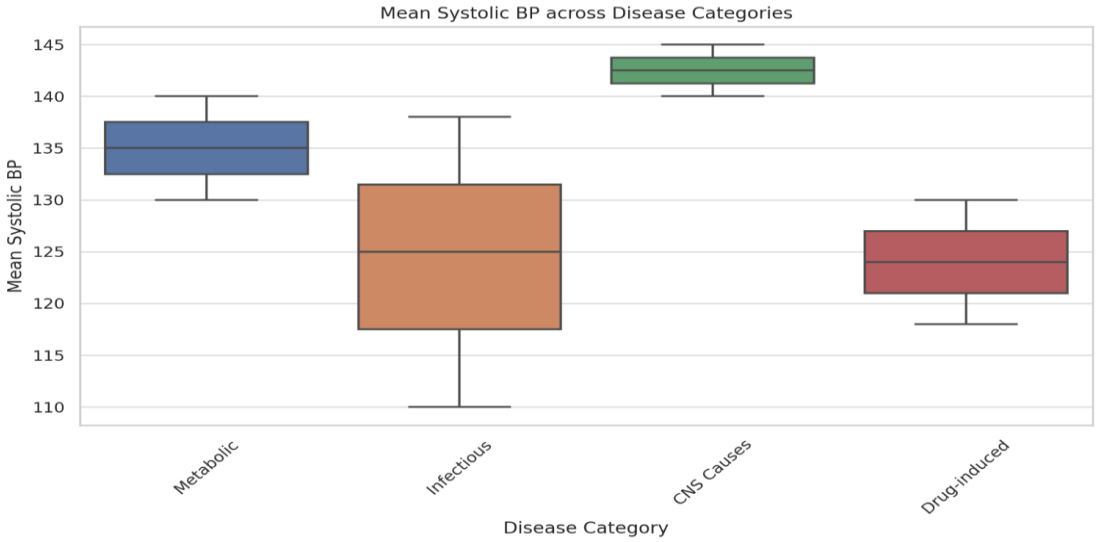

Figure 4 Mean Systolic BP across disease categories

3.3 Diagnostic Investigations

Diagnostic investigations were performed to identify the underlying causes of altered sensorium, with blood glucose testing being the most common.

Table 3 Diagnostic investigations

Investigation	Number of Patients
CT Brain	130
MRI Brain	118
Blood Glucose	210
LFT	150
RFT	170
EEG	18
ABG	163

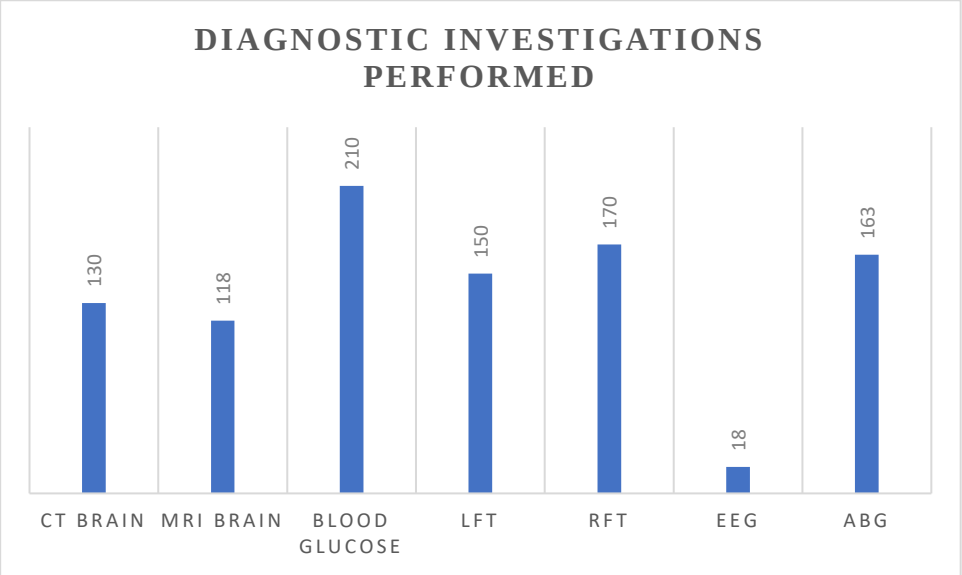

Figure 5 Diagnostic investigation performed

3.4 Etiology and Clinical Outcomes

The Glasgow Coma Scale (GCS) scores, hospital stay durations, recovery rate and LAMA varied by etiology, reflecting differences in severity and treatment complexity.

Table 5 Etiology and clinical outcomes

Etiology	GCS Score (Mean ± SD)	Average Hospital Stay (Days)	Recovery Rate (%)	LAMA (%)	Death Rate (%)
Diabetes Mellitus	10 ± 2	4.2	85	5	5
Thyroid Disorder	9 ± 2	3.8	95	2	0
Electrolyte Imbalance	7 ± 2	5.1	90	8	0
CNS Infection	8 ± 2	6	60	3	20
Wound Infection	7 ± 2	4	80	7	8
Sepsis	8 ± 2	6.8	50	2	30
Stroke	6 ± 2	5.5	65	1	23
Seizure	5 ± 2	7.1	90	0	0
Overdose	7 ± 2	3.5	92	0	0
Withdrawal	13 ± 1	4.5	98	0	0

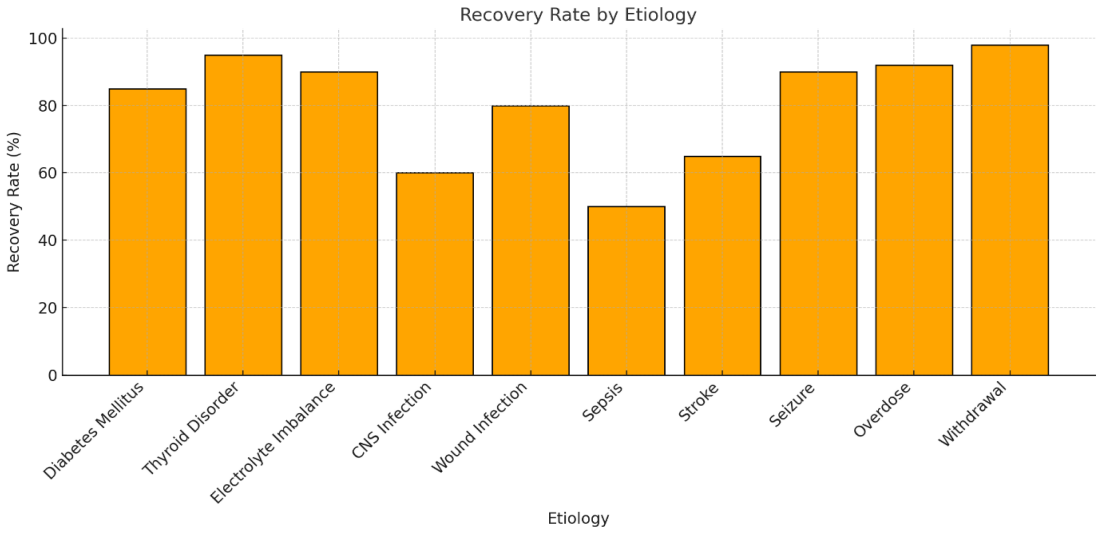

Figure 6 Recovery rate

3.5. Polypharmacy

Polypharmacy was prevalent, with most patients receiving multiple medications.

Table 6 Polypharmacy

No. of Drugs per Patient	Number of Patients	% of Total
1–3	82	30.15
4–6	109	40.07
7–10	54	19.85
>10	27	9.93

3.6 Pattern of Drug Usage

Drug usage patterns highlighted the reliance on antibiotics and antihypertensives, with varying durations of treatment.

Table 7 Pattern of drug use

Disease Category	Specific Disease	Drug Class Used	Common Drugs Used
Metabolic	Diabetes Mellitus	Antidiabetics	Insulin, Metformin
	Thyroid Disorder	Thyroid Hormones	Levothyroxine
	Electrolyte Imbalance	Electrolyte Replacement	Sodium/Potassium chloride
Infectious	CNS Infection	Antibiotics	Ceftriaxone, Meropenem
	Wound Infection	Antibiotics	Ceftriaxone, Meropenem
	Sepsis	IV Antibiotics	Meropenem, Piperacillin-Tazobactam
CNS Causes	Stroke	Antiplatelets	Aspirin, Clopidogrel
	Seizure	Antiepileptics	Phenytoin, Levetiracetam
Drug-induced	Alcohol Overdose	Antidotes	Disulfiram, Thiamine
	Withdrawal	Benzodiazepines	Lorazepam, Diazepam

4. DISCUSSION

This six-month prospective study of 272 patients with non-traumatic altered sensorium (NTAS) at Teerthanker Mahaveer Hospital provides critical insights into its demographics, clinical features, diagnostics, etiologies, and treatment outcomes, with a comparative analysis against existing literature to highlight similarities and differences. The study revealed a balanced urban-rural distribution (59.9% urban, 40.1% rural) and slight male predominance (52.2%), with most patients aged 18–45 years and no representation over 75, suggesting potential underdiagnosis or lower hospital presentation in the elderly, consistent with Han et al., who noted barriers to timely healthcare access in older adults with altered mental status [14]. However, unlike a study by Adan Ali et al. in Somalia, which reported a higher male predominance (68%) and older age distribution (51–60 years peak), this study's younger cohort may reflect regional differences in risk factors like substance use or metabolic disorders [15]. Clinically, NTAS varied by etiology: sepsis showed severe symptoms (85% confusion, 70% lethargy, low BP), requiring ICU care, while metabolic and drug-induced cases were milder and reversible, aligning with Inouye et al.'s findings on the heterogeneous presentation of delirium [16]. Blood glucose testing (77.2%) and neuroimaging (CT: 47.8%, MRI: 43.4%) were common, reflecting metabolic and CNS causes, but limited EEG use (6.6%) suggests possible underdiagnosis of neurological conditions, as Wijdicks et al. emphasized EEG's role in detecting subtle seizures [17]. Compared to Jali et al., who reported higher EEG utilization (15%) in a similar Indian setting, this study's lower use may indicate resource constraints or protocol differences [18]. Metabolic disorders were the most prevalent etiology, with withdrawal cases showing high recovery (98%) and tumors the lowest GCS scores (5 ± 2), consistent with Young et al.'s findings on reversible versus severe etiologies [19]. Sepsis had the worst prognosis (50% recovery, 30% mortality), mirroring Young et al.'s report on sepsis-related neurological complications, while stroke (65% recovery, 23% mortality) aligned with Singhal's observations [20, 21]. High LAMA rates in electrolyte imbalances (8%) suggest premature discharge risks, as noted by Cukor et al. [22]. Polypharmacy was prevalent (40.07% on 4–6 drugs, 9.93% on >10), increasing ADR and DDI risks, supporting Saljoughian's concerns about polypharmacy in elderly patients, though this study's younger cohort suggests broader applicability [23]. Drug utilization was etiology-specific, with antidiabetics, antibiotics, and antiepileptics aligning with Chan and Corso's guidelines, though antibiotic use for sepsis was more aggressive than in some studies, possibly due to local resistance patterns [24]. These findings underscore the need for early diagnosis, etiology-specific treatments, and pharmacovigilance to optimize outcomes and reduce healthcare burden in resource-limited settings, with comparative studies highlighting the influence of regional and resource variations on NTAS management [25].

5. CONCLUSION

This study provides comprehensive insights into the clinical profile, etiologies, and management of non-traumatic altered sensorium (NTAS) in a tertiary care setting. The predominance of metabolic disorders and the high prevalence of polypharmacy (40.07% on 4–6 drugs) underscore the importance of targeted diagnostic and therapeutic strategies. Variations in clinical outcomes, with favorable recovery in withdrawal cases (98%) but poor prognosis in sepsis (50% recovery, 30% mortality), emphasize the need for etiology-specific interventions. Limited EEG utilization (6.6%) suggests potential underdiagnosis of neurological conditions, warranting improved access to advanced diagnostics. The high burden of polypharmacy highlights the necessity for robust pharmacoepidemiological surveillance to minimize adverse drug reactions and optimize therapeutic outcomes. These findings advocate for multidisciplinary approaches, early intervention, and rational prescribing to enhance patient outcomes and reduce the healthcare burden of NTAS, particularly in resource-constrained environments. Future research should focus on longitudinal studies and comparative analyses to further refine clinical guidelines and address regional variations in NTAS management.

REFERENCES

[1] M. Patel, P. Patel, and R. Patel, "Clinical Study of Patients Presenting with Acute Altered Sensorium," International Journal of Pharmaceutical and Clinical Research, vol. 16, no. 7, pp. 858–861, 2024.

[2] S. K. Namindla, J. Gopala Krishna, K. M. Krishna, and V. Keerthana, "Study of Clinical Profile in Patients with Altered Sensorium in Osmania General Hospital," International Journal of Academic Medicine and Pharmacy, 2024.

[3] S. C. LaHue and V. C. Douglas, "Approach to Altered Mental Status and Inpatient Delirium," Neurologic Clinics, vol. 40, no. 1, pp. 45–57, 2022.

[4] J. B. Posner, C. B. Saper, N. D. Schiff, and F. Plum, Plum and Posner's Diagnosis of Stupor and Coma, 5th ed. New York: Oxford University Press, 2019.

[5] K. M. B., "To Study the Different Etiologies of Non-Traumatic Causes of Altered Sensorium and Its Correlation with the Outcome," IOSR Journal of Dental and Medical Sciences, vol. 19, pp. 38–44, 2020.

[6] B. S. Moussa, Z. M. Abd Elatiff, and G. M. Kamal Eldin Elhadary, "Survey Study of the Etiology of Non-Traumatic Altered Consciousness in the Emergency Department at Suez Canal University Hospital in Egypt," World Journal of Clinical Cases, vol. 11, no. 6, pp. 1310–1317, 2023.

[7] H. Adan Ali and M. Farah Yusuf Mohamud, "Epidemiology, Risk Factors and Etiology of Altered Level of Consciousness Among Patients Attending the Emergency Department at a Tertiary Hospital in Mogadishu, Somalia," International Journal of General Medicine, vol. 15, pp. 5297–5306, 2022.

[8] S. N. Jali, S. N. Nayak, B. K. Alexander, D. Tripathy, and B. K. Behera, "Clinical and Investigational Study for the Aetiological Evaluation of Patients in Nontraumatic Altered Sensorium and Its Outcome," International Journal of Research in Medical Sciences, vol. 7, no. 4, pp. 1113–1119, 2019.

[9] E. F. M. Wijdicks, A. A. Kramer, T. Rohs, S. Hanna, F. Sadaka, J. O'Brien, et al., "Comparison of the Full Outline of UnResponsiveness Score and the Glasgow Coma Scale in Predicting Mortality in Critically Ill Patients," Critical Care Medicine, vol. 43, no. 2, pp. 439–444, 2015.

[10] J. Hicks, J. Bishop, K. Sangkuhl, D. Müller, Y. Ji, S. G. Leckband, et al., "Clinical Pharmacogenetics Implementation Consortium (CPIC) Guideline for CYP2D6 and CYP2C19 Genotypes and Dosing of Selective Serotonin Reuptake Inhibitors," Clinical Pharmacology & Therapeutics, vol. 98, no. 2, pp. 127–134, 2015.

[11] L. Chan and G. Corso, "Pharmacological and Non-Pharmacological Prevention and Management of Delirium in Critically Ill and Palliative Patients in the Inpatient Setting: A Review," Frontiers in Medicine, vol. 11, 2024.

[12] E. S. Kasapoğlu and N. Enç, "Role of Multicomponent Non-Pharmacological Nursing Interventions on Delirium Prevention: A Randomized Controlled Study," Geriatric Nursing, vol. 44, pp. 207–214, 2022.

[13] M. Sadlonova, L. Duque, D. Smith, E. N. Madva, H. L. Amonoo, J. Vogelsang, et al., "Pharmacologic Treatment of Delirium Symptoms: A Systematic Review," General Hospital Psychiatry, vol. 79, pp. 60–75, 2022.

[14] J. H. Han et al., "The effect of cognitive impairment on the accuracy of emergency department altered mental status evaluations," Ann Emerg Med., vol. 56, no. 3, pp. 283–290, 2010.

[15] H. Adan Ali and M. Farah Yusuf Mohamud, "Epidemiology, Risk Factors and Etiology of Altered Level of Consciousness Among Patients Attending the Emergency Department at a Tertiary Hospital in Mogadishu, Somalia," Int J Gen Med., vol. 15, pp. 5297–5306, 2022.

[16] S. K. Inouye et al., "Delirium in elderly people," Lancet, vol. 383, no. 9920, pp. 911–922, 2014.

[17] E. F. M. Wijdicks et al., "Comparison of the Full Outline of UnResponsiveness Score and the Glasgow Coma Scale in Predicting Mortality in Critically Ill Patients," Crit Care Med., vol. 43, no. 2, pp. 439–444, 2015.

[18] S. N. Jali et al., "Clinical and investigational study for the aetiological evaluation of patients in nontraumatic altered sensorium and its outcome," Int J Res Med Sci., vol. 7, no. 4, pp. 1113–1119, 2019.

[19] G. B. Young et al., "Neurological complications of sepsis," Continuum (Minneap Minn), vol. 16, no. 3, pp. 57–76, 2010.

[20] V. Singhal, "Clinical approach to acute decline in sensorium," Indian J Crit Care Med., vol. 23, no. Suppl 2, pp. S120–S123, 2019.
[21] V. Singhal, "Study of etiology, clinical profile, and outcome of altered sensorium patients admitted in a tertiary care hospital," Indian J Crit Care Med., 2024.
[22] D. Cukor et al., "Psychosocial aspects of chronic kidney disease: depression and quality of life," Am J Kidney Dis., vol. 50, no. 3, pp. 413–422, 2007.
[23] M. Saljoughian, "Polypharmacy and drug adherence in elderly patients," US Pharm., vol. 44, no. 7, pp. 33–36, 2019.
[24] L. Chan and G. Corso, "Pharmacological and non-pharmacological prevention and management of delirium in critically ill and palliative patients in the inpatient setting: a review," Front Med (Lausanne), vol. 11, 2024.
[25] T. G. Fong et al., "Delirium in elderly adults: diagnosis, prevention, and treatment," Nat Rev Neurol., vol. 5, no. 4, pp. 210–220, 2009.