



Original Article

Cross Sectional Study of Prevalence of Delirium Tremens in Alcohol Withdrawal Syndrome and Its Associated Factors

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ABSTRACT

Background: Delirium tremens (DT) is a life-threatening complication of alcohol withdrawal syndrome (AWS) that requires early identification and management. Limited data exist from northern Kerala regarding the prevalence and clinical correlates of DT in hospitalized patients with AWS.

Objectives: To determine the prevalence of delirium tremens in patients with alcohol withdrawal and to identify factors significantly associated with its development.

Methods: This cross-sectional study included 100 inpatients diagnosed with AWS at Government Medical College, Kannur, over one year (January–December 2024). Data were collected using a semi-structured proforma and the Clinical Institute Withdrawal Assessment for Alcohol–Revised (CIWA-Ar) scale. The diagnosis of DT was based on DSM-5-TR criteria. Statistical analysis included chi-square and Fisher's exact tests, with statistical significance set at $p < 0.05$.

Results: Delirium tremens occurred in 19% of patients, most commonly on the third day of abstinence. Significant associations were found between DT and past history of DT ($p=0.028$), withdrawal seizures ($p=0.001$), hypokalemia ($p=0.032$), thrombocytopenia ($p<0.001$), earlier age at drinking initiation ($p=0.023$), higher CIWA-Ar scores ($p<0.001$), and elevated pulse rate ($p<0.001$). Sociodemographic variables and medical comorbidities showed no significant association with DT.

Conclusion: DT remains a significant complication among patients with AWS, with identifiable clinical and laboratory predictors. Early detection of these risk factors is crucial for targeted intervention and improved outcomes. Further studies with larger samples and age and gender adjusted controls are warranted to establish causal relationships.

Keywords: Delirium tremens, alcohol withdrawal syndrome, risk factors

INTRODUCTION:

Alcohol use is a widespread social and public health issue, with far-reaching effects across physical, psychological, and economic domains. Excessive or prolonged alcohol use is associated with significant harm, particularly to the brain and other major organs [1]. In India, alcohol is the most commonly used psychoactive substance after tobacco, with a reported prevalence of 21.4%. However, consumption rates vary widely across states [2]. There is an estimated 4% prevalence of alcohol dependence in the general population.

Chronic alcohol use is linked to multisystem organ damage and is a key contributor to hospital admissions. One of the most critical complications is Alcohol Withdrawal Syndrome (AWS), which can range from mild symptoms such as anxiety, tremors, and insomnia to severe and life-threatening conditions like withdrawal seizures and Delirium Tremens (DT) [3,4]. DT represents the most severe manifestation of AWS, typically emerging 48 to 72 hours after cessation of alcohol intake. It is characterized by confusion, hallucinations, autonomic instability, and in some cases, seizures [5,6]. If left untreated, DT carries a mortality rate of up to 20%, though early recognition and benzodiazepine therapy can reduce this risk to below 1% [7].

Several risk factors increase the likelihood of severe withdrawal, including older age, high levels of recent alcohol consumption, a history of withdrawal seizures or DT, liver dysfunction, and concurrent medical illnesses [5]. Identifying

these risk factors early is crucial for effective intervention and prevention of complications. Timely assessment using clinical tools, such as the Clinical Institute Withdrawal Assessment for Alcohol–Revised (CIWA–Ar), aids in monitoring symptom severity [8]. However, ongoing research aims to identify reliable biological markers to enhance diagnostic accuracy and guide treatment. Recognizing patients at high risk for complicated AWS allows for proactive management, reducing morbidity, preventing premature discharges, and ultimately improving patient outcomes [7].

Objectives:

1. To determine the prevalence of delirium tremens in alcohol withdrawal subjects
2. To study the factors associated with delirium tremens in alcohol withdrawal syndrome.

Methodology:

This cross-sectional study was conducted in the Department of Psychiatry, Government Medical College, Kannur, over a period of one year, from January 1, 2024, to December 31, 2024. The study included 100 inpatients aged 18 to 65 years who developed alcohol withdrawal symptoms during admission and provided informed consent. Patients were selected using consecutive sampling. Inclusion criteria required participants to be cooperative and medically stable for mental status evaluation. Patients with intellectual disability, comorbid psychiatric illnesses (excluding substance use disorders), other organic brain syndromes, or cases lacking reliable clinical information were excluded.

Data were collected using a semi-structured socio-demographic and clinical proforma, which included variables such as age, gender, educational status, medical history, pattern of substance use, relevant laboratory investigations, and comorbid conditions. The severity of alcohol withdrawal was assessed using the Clinical Institute Withdrawal Assessment for Alcohol–Revised (CIWA–Ar), a validated 10-item scale that requires minimal patient cooperation. CIWA–Ar scores ≤ 8 indicated mild withdrawal, scores between 9 and 15 indicated moderate withdrawal, and scores >15 reflected severe withdrawal symptoms, including a higher risk of seizures and delirium tremens [9].

All inpatients presenting with alcohol withdrawal across various departments were referred to psychiatry for evaluation. Patients meeting eligibility criteria were enrolled after obtaining ethical clearance from the institutional research and ethics committees and after securing written informed consent from the patient and/or a bystander. Alcohol withdrawal state was diagnosed based on ICD-10 criteria, while alcohol withdrawal delirium was diagnosed as per DSM-5-TR criteria, which include disturbances in attention and cognition developing over a short period, fluctuating in severity, and not better explained by another neurocognitive disorder. The diagnosis was confirmed by a consultant psychiatrist.

Statistical analysis was performed using IBM SPSS Statistics, Version 26. Descriptive statistics were used to summarize the data, with means and standard deviations reported for continuous variables and frequencies and percentages for categorical variables. The prevalence of delirium tremens was calculated using frequency and percentage distributions. Associations between categorical variables were assessed using the chi-square test when expected cell frequencies were adequate, and Fisher’s exact test was applied when frequencies were below 5. For larger contingency tables (e.g., 2x3 or 3x3), the Freeman-Halton extension of Fisher’s exact test was used. A p-value <0.05 was considered statistically significant, and all analyses were conducted at a 95% confidence interval.

Participation in the study was voluntary, and informed consent was obtained from all patients or their caregivers. Refusal to participate did not affect treatment in any way. All data were anonymized and treated confidentially. No financial incentives or external funding were involved; all research expenses were borne by the investigator.

Results:

Table 1. Socio-demographic Characteristics of Participants (N=100)

Variable	Category	Frequency
Gender	Male	96
	Female	4
Marital Status	Married	73
	Unmarried	18
	Separated	6
	Widow/Widower	3
Residence	Rural	90
	Urban	10
Co-existing Infection	Present	28
	Absent	72

The study population predominantly consisted of males (96%), reflecting the higher prevalence of alcohol dependence among men in the region. Most participants were married (73%), suggesting a stable marital status despite substance use.

A large majority (90%) lived in rural areas, indicating potential geographic or socio-economic factors influencing alcohol use and severity of withdrawal. Co-existing infections were present in 28% of the participants, highlighting an important clinical consideration as infections can precipitate withdrawal and complicate its management and outcomes.(Table 1)

Table 2. Clinical Characteristics of Participants (N=100)

Variable	Category	Frequency (%)
Family History of ADS	Present	59
	Absent	41
Past History of Delirium Tremens	Present	23
	Absent	77
Past History of Withdrawal Seizures	Present	24
	Absent	76
Mean Age of Drinking Initiation		28.08 years
Mean Duration of Drinking		17.86 years
Mean CIWA-Ar Score		11.54

More than half of the participants (59%) had a family history of alcohol dependence syndrome (ADS), implying a genetic or familial predisposition to alcohol use disorders. A notable proportion had prior episodes of severe withdrawal complications: 23% had a past history of delirium tremens and 24% had experienced withdrawal seizures, underlining the chronicity and severity of alcohol dependence in this sample.

The mean age at drinking initiation was approximately 28 years, with an average drinking duration close to 18 years, reflecting long-term alcohol use prior to hospitalization. The mean CIWA-Ar score of 11.54 indicates that, on average, participants experienced moderate severity of alcohol withdrawal symptoms, necessitating careful clinical monitoring.

Table 3. Significant Associations with Development of Delirium Tremens

Variable	Category	DT Absent	DT Present	p-value	Effect Size (Cramer's V)
Past History of Delirium Tremens	No	66	11	0.028	0.220
	Yes	15	8		
Past History of Withdrawal Seizures	No	67	9	0.001	0.325
	Yes	14	10		
Potassium Level	≥ 3.5 mEq/L	59	9	0.032	0.214
	< 3.5 mEq/L	22	10		
Platelet Count	≥ 1.5 lakh/mm ³	62	4	<0.001	0.460
	< 1.5 lakh/mm ³	19	15		
Age at Initiation of Drinking	> 35 years	49	6	0.023	0.228
	≤ 35 years	32	13		
CIWA-Ar Score	Minimal	37	0	<0.001	0.518
	Moderate	34	7		
	Severe	10	12		
Pulse Rate on Admission	< 100 beats/min	80	12	<0.001	0.515
	≥ 100 beats/min	1	7		

P value < 0.05 was considered statistically significant.

Table 3 highlights factors that showed statistically significant associations with the development of delirium tremens (DT). Participants with a past history of delirium tremens were more likely to develop DT during the study, with 8 out of 23 patients with such a history developing DT, compared to 11 out of 77 without this history (p = 0.028, Cramer's V = 0.220). Similarly, past history of withdrawal seizures was strongly associated with DT, where 10 out of 24 participants with seizures developed DT compared to 9 out of 76 without seizures (p = 0.001, Cramer's V = 0.325).

Biochemical parameters such as potassium levels also showed a significant association: 10 of 32 participants with potassium levels below 3.5 mEq/L developed DT compared to 9 of 68 with normal potassium levels (p = 0.032, Cramer's V = 0.214). Platelet count was markedly associated, with 15 of 34 participants having counts below 1.5 lakh/mm³ developing DT, while only 4 of 66 participants with higher platelet counts developed DT (p < 0.001, Cramer's V = 0.460). Age at initiation of drinking was statistically significant; 13 of 45 participants who started drinking at or before 35 years developed DT, compared to 6 of 55 who started after 35 years (p = 0.023, Cramer's V = 0.228).

Severity of withdrawal symptoms measured by CIWA-Ar score had a highly statistically significant association with DT: none of the 37 participants with minimal scores developed DT, while 7 of 41 with moderate scores and 12 of 22 with severe scores developed DT ($p < 0.001$, Cramer's $V = 0.518$). Finally, pulse rate on admission was also strongly linked with DT; among participants with pulse rate ≥ 100 beats/min, 7 out of 8 developed DT, whereas only 12 out of 92 participants with pulse rate below 100 developed DT ($p < 0.001$, Cramer's $V = 0.515$).

Discussion:

This cross-sectional study included 100 patients in alcohol withdrawal admitted at Government Medical College, Kannur to examine the prevalence and factors associated with delirium tremens (DT). The mean age of participants was 50.22 years, with over half aged 50–65 years, consistent with studies by Menecier et al. and Khan et al. reporting mean ages of 47.6 and 51 years, respectively [10,11]. While some studies have associated age over 55 with DT [12,13], this was not observed here. Males constituted 96% of participants, mirroring similar findings in other research [14,15]. Most were married (73%) and from rural areas (90%), reflecting regional demographics.

The mean age at drinking initiation was 28.08 years with an average duration of 17.86 years, similar to Bakhla et al.'s findings of 21.63 years onset and 6.49 years dependence [16]. Substance use other than alcohol, including nicotine (41%) and cannabis (5%), did not reach dependence and showed no significant association with DT, contrary to some reports [17,18]. Comorbid medical conditions were present in 66%, including alcoholic liver disease in 20%; however, no significant correlation with DT was found, possibly due to limited sample size, although other studies suggest otherwise [3,19,20].

A family history of alcohol dependence was reported by 59% but was not linked to DT here, differing from literature that notes a positive association [20,21]. Past delirium tremens (23%) and withdrawal seizures were significantly associated with DT, consistent with previous research [7,18,23,24]. The incidence of DT was 19%, occurring mainly on the third day after cessation, lower than some global studies [7,24,25] but higher than others [12,17]. Withdrawal seizures were observed in 11%, mostly on the second day, comparable to prior findings [24–26].

Hypokalemia was present in 32%, supporting associations between low potassium and DT reported in literature [12,18,20,26]. Thrombocytopenia was noted in 34%, with platelet count significantly related to DT, as seen in other studies [18,25]. Parameters like bicarbonate and creatinine were not evaluated but have been linked to DT elsewhere [26].

The mean CIWA-Ar score was 11.54, with 41% showing moderate and 22% severe withdrawal severity, paralleling Malik et al. and Bakhla et al. [16,27]. The CIWA-Ar score was a strong predictor of DT ($p < 0.001$), supporting findings by Salottolo et al. and Schuckit et al. that scores above 10 or 15 increase DT risk [12,18,28,29]. Pulse rate over 100 beats/min was significantly associated with DT ($p < 0.001$), consistent with other reports [7,18]. Most subjects had an MCV over 80 fL (93%), but none exceeded normal ranges, differing from studies linking high MCV with DT risk [30].

Conclusion:

Delirium tremens occurred in 19% of patients with alcohol withdrawal, typically around the third day of abstinence. Significant associations were found with past history of DT and withdrawal seizures, low potassium and platelet counts, younger age at drinking initiation, higher CIWA-Ar scores, and elevated pulse rate. Sociodemographic factors and medical comorbidities showed no significant link. These results highlight the need for careful assessment to identify patients at risk of DT for timely management. Larger studies are needed to confirm these findings.

STRENGTHS OF STUDY

The use of CIWA -Ar scale ensures standardized objective assessment of withdrawal severity, strengthening the reliability and validity of the results.

The study evaluates multiple sociodemographic and clinical factors associated with delirium tremens contributing to better early identification.

LIMITATIONS

Small sample size and cross sectional study design couldn't determine causal relationship between variables.

Effect of other substances of abuse on study findings cannot be completely ruled out.

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REFERENCES:

1. Alderazi Y, Brett F. Alcohol and the nervous system. *Curr Diagn Pathol*. 2007 Jun 1;13(3):203–9.
2. Murthy P, Manjunatha N, Subodh BN, Chand PK, Benegal V. Substance use and addiction research in India. *Indian J Psychiatry*. 2010 Jan;52(Suppl1):S189–99.

3. Shield KD, Parry C, Rehm J. Chronic diseases and conditions related to alcohol use. *Alcohol Res Curr Rev*. 2013;35(2):155–73.
4. Bayard M, McIntyre J, Hill KR, Woodside J. Alcohol withdrawal syndrome. *Am Fam Physician*. 2004 Mar 15;69(6):1443–50.
5. Wright T, Myrick H, Henderson S, Peters H, Malcolm R. Risk Factors for Delirium Tremens: A Retrospective Chart Review. *Am J Addict*. 2006 May 6;15(3):213–9.
6. McKeon A, Frye MA, Delanty N. The alcohol withdrawal syndrome. *J Neurol Neurosurg Psychiatry*. 2008 Aug;79(8):854–62.
7. Lee JH, Jang MK, Lee JY, Kim SM, Kim KH, Park JY, et al. Clinical predictors for delirium tremens in alcohol dependence. *J Gastroenterol Hepatol*. 2005 Dec;20(12):1833–7.
8. Sullivan JT, Sykora K, Schneiderman J, Naranjo CA, Sellers EM. Assessment of Alcohol Withdrawal: the revised clinical institute withdrawal assessment for alcohol scale (CIWA-Ar). *Br J Addict*. 1989 Nov;84(11):1353–7.
9. Hall W, Zador D. The alcohol withdrawal syndrome. *Lancet Lond Engl*. 1997 Jun 28;349(9069):1897–900.
10. Khan A, Levy P, DeHorn S, Miller W, Compton S. Predictors of Mortality in Patients with Delirium Tremens. *Acad Emerg Med*. 2008;15(8):788–90.
11. Mennecier D, Thomas M, Arvers P, Corberand D, Sinayoko L, Bonnefoy S, et al. Factors predictive of complicated or severe alcohol withdrawal in alcohol dependent inpatients. *Gastroentérologie Clin Biol*. 2008 Aug;32(8–9):792–7.
12. Salottolo K, McGuire E, Mains CW, van Doorn EC, Bar-Or D. Occurrence, Predictors, and Prognosis of Alcohol Withdrawal Syndrome and Delirium Tremens Following Traumatic Injury. *Crit Care Med*. 2017 May;45(5):867–74.
13. Baby S, Murthy P, Thennarasu K, Chand PK, Viswanath B. Comparative outcome in patients with delirium tremens receiving care in emergency services only versus those receiving comprehensive inpatient care. *Indian J Psychiatry*. 2017;59(3):293–9.
14. Wojnar M, Wasilewski D, Matsumoto H, Cedro A. Differences in the course of alcohol withdrawal in women and men: a Polish sample. *Alcohol Clin Exp Res*. 1997 Nov;21(8):1351–5.
15. Canales FJ, Davis J, Girgla N, Emami M, Cooper T, Carlson RW. Alcohol Withdrawal Syndrome in Women vs Men: Analysis of 1496 Cases at a Single Site. *Am J Crit Care*. 2022 May 1;31(3):212–9.
16. Bakhla AK, Khess CRJ, Verma V, Hembram M, Praharaj SK, Soren S. Factor Structure of CIWA-Ar in Alcohol Withdrawal. *J Addict*. 2014;2014(1):745839.
17. Moore DT, Fuehrlein BS, Rosenheck RA. Delirium tremens and alcohol withdrawal nationally in the Veterans Health Administration. *Am J Addict*. 2017 Oct;26(7):722–30.
18. Schuckit MA. Recognition and management of withdrawal delirium (delirium tremens). *N Engl J Med*. 2014 Nov 27;371(22):2109–13.
19. Barrio E, Tomé S, Rodríguez I, Gude F, Sánchez-Leira J, Pérez-Becerra E, et al. Liver disease in heavy drinkers with and without alcohol withdrawal syndrome. *Alcohol Clin Exp Res*. 2004 Jan;28(1):131–6.
20. Qureshi A, Junaid J, Shaikh N, Siddiqua A, Khan A. Relationship of Biochemical and Hematological Markers With Alcohol Withdrawal Severity. *Cureus*. 2024 Oct;16(10):e71914.
21. Unlu H, Macaron MM, Ayraller Taner H, Kaba D, Akin Sari B, Schneekloth TD, et al. Sex difference in alcohol withdrawal syndrome: a scoping review of clinical studies. *Front Psychiatry*. 2023 Sep 22;14:1266424.
22. Perälä J, Kuoppasalmi K, Pirkola S, Härkänen T, Saarni S, Tuulio-Henriksson A, et al. Alcohol-induced psychotic disorder and delirium in the general population. *Br J Psychiatry J Ment Sci*. 2010 Sep;197(3):200–6.
23. Thiercelin N, Rabiah Lechevallier Z, Rusch E, Plat A. Facteurs de risque du delirium tremens : revue de la littérature. *Rev Médecine Interne*. 2012 Jan;33(1):18–22.
24. Yıldırım YE, Umut G, Evren C, Yeral E, Secerli H. Neutrophil-lymphocyte ratio as a predictor of delirium tremens in hospitalized patients with alcohol withdrawal. *Alcohol Fayettev N*. 2023 Jun;109:43–8.
25. Kim DW, Kim HK, Bae EK, Park SH, Kim KK. Clinical predictors for delirium tremens in patients with alcohol withdrawal seizures. *Am J Emerg Med*. 2015 May;33(5):701–4.
26. Manjaly S, Joju A, Francis A. Delirium, polypharmacy and adverse outcomes: findings from a hospital in Kerala, India. *Delirium Commun [Internet]*. 2023 Apr 14 [cited 2025 Mar 18]; Available from: <https://deliriumcommunicationsjournal.com/article/74100-delirium-polypharmacy-and-adverse-outcomes-findings-from-a-hospital-in-kerala-india>
27. Malik R, Dhillon HS, Sahu VK, Sasidharan S, Dhillon GK. Study of relationship between serum creatine phosphokinase levels with severity of alcohol withdrawal. *Arch Ment Health*. 2021 Jun;22(1):63.
28. Hanank DF, Rajin T, Shynu R. Risk Factors for Development of Delirium in Alcohol Use Disorder, A Case Control Study from A Tertiary Psychiatry Hospital in Kerala. *Indian J Psychiatry*. 2022 Mar;64(Suppl 3):S561.
29. Wood E, Albarqouni L, Tkachuk S, Green CJ, Ahamad K, Nolan S, et al. Will this adult patient develop severe alcohol withdrawal? The Rational Clinical Examination Systematic Review. *JAMA*. 2018 Aug 28;320(8):825–33.
30. Findley JK, Park LT, Siefert CJ, Chiou GJ, Lancaster RT, Demoya M, et al. Two routine blood tests-mean corpuscular volume and aspartate aminotransferase-as predictors of delirium tremens in trauma patients. *J Trauma*. 2010 Jul;69(1):199–201.