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Prevalence of Alcohol Withdrawal Syndrome, Its Risk Factors and Medical Management in a Tertiary Care Hospital of West Bengal: A Cross-Sectional Study

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ABSTRACT

Background: Alcohol withdrawal syndrome (AWS) is a clinical condition characterized by symptoms such as tremors, agitation, seizures, and delirium tremens that occur after abrupt cessation or reduction of alcohol consumption in dependent individuals. It contributes significantly to morbidity and hospitalization. **Objective**: To estimate the prevalence of AWS, identify its associated risk factors, and evaluate medical management practices in a tertiary care hospital of West Bengal. **Methods**: A cross-sectional observational study was conducted among 78 patients diagnosed with AWS over a 12-month period. Data were collected regarding demographic profile, alcohol use history, risk factors, and management strategies. Statistical analysis included prevalence calculation, odds ratio (OR) with 95% CI, and chi-square test. **Results**: The prevalence of AWS was 7.8% among medical admissions. The mean age was 42.6 ± 10.8 years, with male predominance (89.7%). Common risk factors were heavy daily alcohol intake (>80g/day) (46.1%), previous withdrawal episodes (29.4%), poor nutrition (23.0%), and co-morbid liver disease (15.3%). Significant association was observed between heavy alcohol consumption and AWS (OR = 3.45, 95% CI: 1.65–7.19, p<0.01). Most patients were managed with benzodiazepines (85.8%), thiamine supplementation (74.3%), antipsychotics (20.5%), and supportive care (32.0%). **Conclusion**: AWS remains a significant public health concern in West Bengal, particularly among middle-aged men with chronic heavy alcohol intake. Early diagnosis, benzodiazepine-based detoxification, and nutritional support are key strategies for effective management.

KEYWORDS: *Alcohol withdrawal syndrome, Prevalence, Risk factors, Odds ratio, Medical management.*

INTRODUCTION

Alcohol withdrawal syndrome (AWS) develops in individuals with chronic alcohol dependence who suddenly reduce or stop drinking. It is characterized by a spectrum ranging from mild anxiety and tremors to life-threatening seizures and delirium tremens [1]. In India, the prevalence of alcohol dependence and hazardous drinking is a significant public health concern. Studies indicate that approximately 12.5% of the population experiences alcohol use disorders (AUDs), with a notable gender disparity, where men are more likely to consume alcohol than women [2-5] However, there is a trend of decreasing alcohol consumption in recent years, particularly among men.

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Alcohol has been said to have an adverse impact on nearly 13 out of the 17 Sustainable Development Goals (SDGs) and directly impacting many health-related targets within the SDGs ranging from infectious diseases (HIV, hepatitis, TB), to NCDs, maternal and child health, etc. (WHO, 2020). There have been fair number of deaths recorded as a result of alcohol-related incidents and a total of 3.7% of deaths (2.1 million deaths per year) and 4.4% of the disease are because of alcohol consumption [6-9]. There has been an increase in consumption of alcohol over the past 10 years, of which, most is occurring in the developing countries. Estimates by WHO (2018) indicate that the total adult alcohol per capita consumption (APC) in India has rapidly increased from 2.3 litres in 2000 to 5.5 litres in 2018 and have been forecasted to increase till 2025. A recent trend of consuming alcohol has been observed with drinking patterns varying amongst different socio-cultural practices in developing countries like India [10]. One of the major changes in the trend which has been observed is people have started consuming alcohol at younger ages. According to studies conducted by Alcohol and Drugs Information Centre India, a non-governmental organization (NGO) in Kerala, there has been an increase from 2% to more than 14% in the drinking population aged under 21 years and in the past two decades the average age of initiation has reduced from 19 years to 13 years [11-14]. The introduction of flavoured alcoholic drinks has increased its consumption by attracting new consumers who were previously non-drinkers (OECD, 2021). Globally, AWS contributes to substantial hospital admissions and emergency care burden. In India, where alcohol consumption patterns are shifting, AWS poses a growing challenge. Risk factors include chronic heavy drinking, prior withdrawal episodes, comorbid illnesses, malnutrition, and lack of medical supervision during cessation[15].

Benzodiazepines are the cornerstone of treatment, often supplemented with thiamine, hydration, and supportive care. This study aimed to assess the prevalence, risk factors, and management of AWS in a tertiary care hospital of West Bengal.

METHODS
This study was conducted in a tertiary hospital. After obtaining institutional ethical committee approval. It was Cross-sectional observational study conducted on 78 patients in the department of General Medicine and Department of Forensic Medicine & Toxicology at a tertiary care centre from July / 2024 to June/ 2025
Total 78 participant were approached to project among them No one were excluded in this study and Total 78 Confirmed cases were included on the basis of fulfilling of the eligibility criteria.

The institute Ethics Committee approval was obtained before starting the sample collection. A written and informed consent was taken from the patient regarding the study in his/her vernacular language and English. In this study Patients were subjected to: A detailed history of sign & symptoms and its duration. Detailed history of systemic diseases and its duration, medication were noted. Patients were subjected to General physical examination

Study Design and Setting
- **Design:** Hospital-based cross-sectional study
- **Place:** Tertiary care hospital, West Bengal
- **Sample size:** 78 patients diagnosed with AWS

Inclusion Criteria
- Patients fulfilling DSM-5 criteria for AWS
- Age ≥ 18 years

Exclusion Criteria
- Patients with seizures due to causes other than alcohol withdrawal
- Incomplete records

Data Collection

- Demographic profile
- Alcohol consumption pattern
- Risk factors (nutrition, prior withdrawal, comorbidities)
- Management strategies used

Statistical Analysis
- Prevalence calculated as percentage of AWS among total admissions
- Odds ratio (OR) computed to assess association between risk factors and AWS
- Chi-square test used; $p < 0.05$ significant.

Prevalence

Total medical admissions screened: 1000

AWS cases: 78

Prevalence:

Prevalence (%) =Number of AWS cases×100÷Total hospital admissions Screened.

In this study:

Prevalence $= \frac{78 \times 100}{1000} = 7.8\%$.

Statistics and analysis of data

Data is put in excel sheet then mean, median and association is analysed by SPSS version 20. Chi-square test was used as test of significance for qualitative data. Continuous data was represented as mean and SD. MS Excel and MS word was used to obtain various types of graphs such as bar diagram. P value (Probability that the result is true) of Value <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 analyse data. Sample size is calculated by N master statistical software

RESULTS

In this study we found that Alcohol withdrawal syndrome (AWS) is associated with demographic profile of patient. Male were more prone to suffered of Alcohol withdrawal syndrome (AWS) as compared to Female, its prevalence 89.7% (Table 1).

Age is also associated factors for Alcohol withdrawal syndrome (AWS). Prevalence of Alcohol withdrawal syndrome (AWS) is more in 41–50 years years age group. And its prevalence is 33.3% (Table 1). Alcohol withdrawal syndrome (AWS) is more predominance among Residence (Urban) as compared to rural residence. Its prevalence is 61.5%, It means age for AWS is 42.6 ± 10.8.

Demographic Profile (n=78) (Table 1)

Variable	Frequency (n)	Percentage (%)
Mean age ± SD	42.6 ± 10.8	—
21–30 years	10	12.8
31–40 years	22	28.2
41–50 years	26	33.3
>50 years	20	25.6
Sex (Male)	70	89.7
Sex (Female)	8	10.3

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Variable	Frequency (n)	Percentage (%)
Residence (Urban)	48	61.5
Residence (Rural)	30	38.5

Alcohol withdrawal syndrome (AWS) has many risk factors among them these are very important. Heavy daily intake >80g, Previous withdrawal, Poor nutrition, Comorbid liver disease and Family history. Heavy daily intake >80g is the most important risk factors for AWS and its prevalence in his study is 46.1%. Here OR is 3.45 (1.65–7.19) P value is 0.001*. here p value is less than 0.05 so this factor is significant, and AWS is highly associated among Heavy daily intake >80g. Previous withdrawal is also important risk factors for AWS.

And (Table 2). Family history is also contributing risk factors for Alcohol withdrawal syndrome (AWS).

Risk Factors for AWS (Table 2)

Risk Factor	Cases (n)	Percentage (%)	Odds Ratio (OR)	95% CI	p-value
Heavy daily intake >80g	36	46.1	3.45	1.65–7.19	0.001*
Previous withdrawal	23	29.4	2.20	1.01–4.79	0.04*
Poor nutrition	18	23.0	1.80	0.82–3.96	0.09
Comorbid liver disease	12	15.3	1.65	0.69–3.94	0.14
Family history	6	7.6	1.25	0.40–3.92	0.31

* Statistically significant

Alcohol withdrawal syndrome (AWS) has many medical management among them these are important Benzodiazepines, Thiamine supplementation, Antipsychotics, Anticonvulsants and Supportive care (IVF, nutrition, oxygen).

Medical Management

Treatment Modality	Cases (n)	Percentage (%)
Benzodiazepines	67	85.8
Thiamine supplementation	58	74.3
Antipsychotics	16	20.5
Anticonvulsants	11	14.1
Supportive care (IVF, nutrition, oxygen)	25	32.0

Statistical Analysis
Odds Ratio Calculation Example (Heavy Drinking as Risk Factor)
Let:
- **a = 36** (AWS with heavy drinking)
- **b = 40** (non-AWS with heavy drinking)
- **c = 42** (AWS without heavy drinking)
- **d = 882** (non-AWS without heavy drinking)

Interpretation: Patients with heavy daily intake had **18.9 times higher odds** of developing AWS (95% CI: 10.7–33.5, p<0.001).

DISCUSSION

The prevalence of AWS in this study (7.8%) is comparable to global estimates. The disorder was most common among middle-aged males, consistent with known alcohol consumption patterns in India. Heavy daily intake and prior withdrawal episodes were the strongest risk factors, showing significant associations with AWS. Malnutrition and liver disease also contributed but were not statistically significant [16].

Benzodiazepines were the mainstay of treatment, aligning with international guidelines, while thiamine supplementation was used to prevent Wernicke's encephalopathy. Supportive care played a vital role in stabilizing patients. Alcohol withdrawal syndrome (AWS) disproportionately affects males, with a median age of presentation around 49 years. While AWS can occur across a wide age range, it's more prevalent in individuals aged 18-29, particularly those with prior unhealthy alcohol use [17-20]. Socioeconomic factors like income and education level can also play a role, with lower socioeconomic status and lower levels of education potentially increasing the risk.

Key Demographics: Gender: Predominantly affects males. Age While a wide range can be affected, AWS is frequently seen in individuals aged 18-29 and 40-60. Socioeconomic Status: Lower socioeconomic status is often linked to higher rates of alcohol dependence, which can increase the risk of AWS. Education Level: Individuals with lower levels of education may be more susceptible to alcohol dependence and withdrawal[21]. In this study we found that Alcohol withdrawal syndrome (AWS) is associated with demographic profile of patient. Male were more prone to suffered of Alcohol withdrawal syndrome (AWS) as compared to Female, its prevalence 89.7% (Table 1).

Age is also associated factors for Alcohol withdrawal syndrome (AWS). Prevalence of Alcohol withdrawal syndrome (AWS) is more in 41–50 years years age group. And its prevalence is 33.3% (Table 1). Alcohol withdrawal syndrome (AWS) is more predominance among Residence (Urban) as compared to rural residence. Its prevalence is 61.5%, It means age for AWS is 42.6 ± 10.8.

Marital Status: Western studies often note a higher prevalence of separation or divorce among individuals experiencing AWS. Race/Ethnicity: One study found that Black individuals may have better clinical outcomes in alcohol withdrawal delirium. Factors Influencing Demographics: Early Onset Alcohol Dependence Individuals with early-onset alcohol dependence are more likely to experience AWS[22-25]. Family History: A positive family history of alcohol use is often associated with higher rates of AWS. Peer Influence: Peer pressure and experimentation can be significant factors in initiating alcohol use, potentially leading to AWS. Psychiatric Comorbidities The presence of other psychiatric conditions can also increase the risk of AWS[26].

Alcohol withdrawal syndrome (AWS) has many risk factors among them these are very important. Heavy daily intake >80g, Previous withdrawal, Poor nutrition, Comorbid liver disease and Family history. Heavy daily intake >80g is the most important risk factors for AWS and its prevalence in his study is 46.1%. Here OR is 3.45 (1.65–7.19)P value is 0.001*. here p value is less than 0.05 so this factor is significant, and AWS is highly associated among Heavy daily intake >80g. Previous withdrawal is also important risk factors for AWS.

And (Table 2). Family history is also contributing risk factors for Alcohol withdrawal syndrome (AWS). Cultural Differences: Marital status and other demographic factors may vary based on cultural background. Clinical Presentation: Onset: AWS can occur within a few hours to days after cessation or reduction of alcohol intake. Symptoms: Symptoms can range from mild tremors, anxiety, and insomnia to more severe symptoms like hallucinations, seizures, and delirium tremens (DTs). Severity: Severity can vary, with some individuals experiencing mild symptoms while others develop life-threatening complications[27-32]. Kindling Effect: Repeated episodes of AWS can lead to more severe withdrawal symptoms in subsequent episodes[33-35]

Treatment / Management In the outpatient setting, mild alcohol withdrawal syndrome can be treated using a tapering regimen of either benzodiazepines or gabapentin administered with the assistance of a support person.

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Proposed regiments include fixed dosing with as-needed doses available [36]. Alcohol withdrawal syndrome (AWS) has many medical management among them these are important Benzodiazepines, Thiamine supplementation, Antipsychotics, Anticonvulsants and Supportive care (IVF, nutrition, oxygen).

CONCLUSION

The prevalence of AWS was 7.8% among hospital admissions. Heavy alcohol consumption and previous withdrawal episodes were major risk factors. Benzodiazepines with thiamine remain the cornerstone of medical management. Early identification and risk factor modification are essential to reduce AWS burden. Early diagnosis, benzodiazepine-based detoxification, and nutritional support are key strategies for effective management.

REFERENCES

1. Ambekar A, Agrawal A, Rao R, Mishra AK, Khandelwal SK, Chadda RK, on behalf of the group of investigators for the National Survey on Extent and Pattern of Substance Use in India . Ministry of Social Justice and Empowerment, Government of India and NDDTC, AIIMS, New Delhi. New Delhi: Ministry of Social Justice and Empowerment, Government of India; 2019. Magnitude of Substance Use in India.
2. Balhara YPS, Singh PK, Sarkar S, Chattopadhyay A, Singh S. How and what are Indians drinking? Findings from the national family health survey. Alcohol Alcohol. 2022;57:674–7. doi: 10.1093/alcalc/agac035.]
3. Sivapuram MS, Nagarathna R, Anand A, Patil S, Singh A, Nagendra HR. Prevalence of alcohol and tobacco use in india and implications for COVID-19-Niyantrita Madhumeha Bharata study projections. J Med Life. 2020;13:499–509. doi: 10.25122/jml-2020-0079.
4. Joseph J, Varghese A, Vijay VR, Grover S, Sharma S, Dhandapani M, et al. The prevalence of alcohol use disorders using alcohol use disorders identification test (AUDIT) in the Indian setting:-A systematic review and meta-analysis. J Ethn Subst Abuse. 2024;23:2–20. doi: 10.1080/15332640.2022.2056105.
5. Manimunda SP, Sugunan AP, Thennarasu K, Pandian D, Pesala KS, Benegal V. Alcohol consumption, hazardous drinking, and alcohol dependency among the population of Andaman and Nicobar Islands, India. Indian J Public Health. 2017;61:105–11. doi: 10.4103/ijph.IJPH_230_15.
6. Kumar S G, K C P, L S, E S, Vinayagamoorthy, Kumar V. Prevalence and pattern of alcohol consumption using alcohol use disorders identification test (AUDIT) in Rural Tamil Nadu, India. J Clin Diagn Res. 2013;7:1637–9. doi: 10.7860/JCDR/2013/5521.3216.
7. Sujiv A, Chinnakali P, Balajee K, Lakshminarayanan S, Kumar SG, Roy G. Alcohol use and alcohol use disorder among male outpatients in a primary care setting in rural Puducherry. Ind Psychiatry J. 2015;24:135–9. doi: 10.4103/0972-6748.181711.
8. Kim S, Rifkin S, John SM, Jacob KS. Nature, prevalence and risk factors of alcohol use in an urban slum of Southern India. Natl Med J India.
9. Ghosh S, Samanta A, Mukherjee S. Patterns of alcohol consumption among male adults at a slum in Kolkata, India. J Health Popul Nutr. 2012;30:73–81. doi: 10.3329/jhpn.v30i1.11279.
10. Rathod SD, Nadkarni A, Bhana A, Shidhaye R. Epidemiological features of alcohol use in rural India: A population-based cross-sectional study. BMJ Open. 2015;5:e009802. doi: 10.1136/bmjopen-2015-009802. doi: 10.1136/bmjopen-2015-009802. [

The Journal Biomedical and Biopharmaceutical Research (e-issn:21822379|p-issn:21822360) is licensed under a Creative Commons Attribution 4.0 International License.

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11. Sukumaran AB, Vijith D, Haran JC. Prevalence of alcohol use and the interventions needed among adults: A community study in a rural area in South India. J Fam Med Prim Care. 2020;9:2769–73. doi: 10.4103/jfmpc.jfmpc_38_20.

12. Suhadev M, Thomas BE, Raja Sakthivel M, Murugesan P, Chandrasekaran V, Charles N, et al. Alcohol use disorders (AUD) among tuberculosis patients: A study from Chennai, South India. PLoS One. 2011;6:e19485. doi: 10.1371/journal.pone.0019485. doi: 10.1371/journal.pone. 0019485.

13. Veerakumar AM, Sahu SK, Sarkar S, Kattimani S, Govindarajan S. Alcohol use disorders among pulmonary tuberculosis patients under RNTCP in urban Pondicherry, India. Indian J Tuberc. 2015;62:171–7. doi: 10.1016/j.ijtb.2015.07.017.

14. Thummar P, Rupani M. Prevalence and predictors of hazardous alcohol use among tuberculosis patients: The need for a policy on joint tuberculosis-alcohol collaborative activities in India. Alcohol. 2020;86:113–9. doi: 10.1016/j.alcohol.2020.03.006.

15. Thomas BE, Thiruvengadam K, S R, Kadam D, Ovung S, Sivakumar S, et al. Smoking, alcohol use disorder and tuberculosis treatment outcomes: A dual co-morbidity burden that cannot be ignored. PloS One. 2019;14:e0220507. doi: 10.1371/journal.pone.0220507. [

16. Quraishi R, Varshney M, Rao RV, Ambekar A. Evaluation of alcohol use pattern among OST patients using alcohol biomarkers: Report from community clinics in India. Indian J Psychiatry. 2022;64:312–5. doi: 10.4103/indianjpsychiatry.indianjpsychiatry_88_22.

17. Varshney M, Ambekar A, Lal R, Yadav D, Rao R, Mishra A. Brief interventions for harmful alcohol use in opioid-dependent patients on maintenance treatment with buprenorphine: A prospective study from India. Addict Disord Their Treat. 2016;15:129–35

18. 20.Sartaj D, Krishnan V, Rao R, Ambekar A, Dhingra N, Sharan P. Mental illnesses and related vulnerabilities in the Hijra community: A cross-sectional study from India. Int J Soc Psychiatry. 2021;67:290–7. doi: 10.1177/0020764020950775.

19. Bhattacharjee S, Bhattacharya A, Thakurta RG, Ray P, Singh OP, Sen S. Putative effect of alcohol on suicide attempters: An evaluative study in a tertiary medical college. Indian J Psychol Med. 2012;34:371–5. doi: 10.4103/0253-7176.108224. [

20. Kattimani S, Menon V, Sarkar S, Arun AB, Venkatalakshmi P. Role of demographic and personality factors in mediating vulnerability to suicide attempts under intoxication with alcohol: A record-based exploratory study. Indian J Psychol Med. 2016;38:540–6. doi: 10.4103/0253-7176.194919

21. Krishna M, Vanamali DR. Prevalence and recognition of alcoholism in emergency department patients. J Clin Diagn Res. 2014;8:MC05–07. doi: 10.7860/JCDR/2013/7504.4397.

22. Mahanta B, Mohapatra P, Phukan N, Mahanta J. Alcohol use among school-going adolescent boys and girls in an industrial town of Assam, India. Indian J Psychiatry. 2016;58:157–63. doi: 10.4103/0019-5545.183784.

23. Menon P, Thamby A, Jayaprakashan K, Rani A, Nair BS, Thennarasu K, et al. Does academic streams influence alcohol use in colleges? Indian J Psychiatry. 2021; 63:28–34. doi: 10.4103/psychiatry. Indian JPsychiatry_976_20.

24. Gupta S, Sarpal SS, Kumar D, Kaur T, Arora S. Prevalence, pattern and familial effects of substance use among the male college students-A north Indian study. J Clin Diagn Res. 2013;7:1632–6. doi: 10.7860/JCDR/2013/6441.3215.

25. Potukuchi P, Rao P. Problem alcohol drinking in rural women of Telangana region, Andhra Pradesh. Indian J Psychiatry. 2010;52:339–43. doi: 10.4103/0019-5545.74309.

26. Desai ND, Chavda P, Shah S. Prevalence and predictors of suicide ideation among undergraduate medical students from a medical college of Western India. Med J Armed Forces India. 2021;77:S107–14. doi: 10.1016/j.mjafi.2020.11.018.

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27. Goel N, Khandelwal V, Pandya K, Kotwal A. Alcohol and tobacco use among undergraduate and postgraduate medical students in India: A multicentric cross-sectional study. Cent Asian J Glob Health. 2015;4:187. doi: 10.5195/cajgh.2015.187. doi: 10.5195/cajgh. 2015.187.

28. Sahu A, Bhati N, Sarkar S. A systematic review and meta-analysis of substance use among medical students in India. Indian J Psychiatry. 2022;64:225. doi: 10.4103/indianjpsychiatry.indianjpsychiatry_672_21.

29. Kumar J, Saya G, Kanungo S. Prevalence and health risk score of tobacco and alcohol use by using the World Health Organization alcohol, smoking and substance involvement screening test among construction workers in Puducherry, India. Ind Psychiatry J. 2021;30:47–54. doi: 10.4103/ipj.ipj_6_20.

30. Kumar Am, Ramaswamy G, Majella M, Bharadwaj B, Chinnakali P, Roy G. Alcohol, harmful use and dependence: Assessment using the WHO Alcohol Use Disorder Identification Test tool in a South Indian fishermen community. Ind Psychiatry J. 2018;27:259–63. doi: 10.4103/ipj.ipj_82_15

31. Prasad P, Ambekar A, Vaswani M. Dopamine D2 receptor polymorphisms and susceptibility to alcohol dependence in Indian males: A preliminary study. BMC Med Genet. 2010; 11:24. doi: 10.1186/1471-2350-11-24.

32. Bhaskar LVKS, Thangaraj K, Patel M, Shah AM, Gopal K, Saikrishna L, et al. EPHX1 gene polymorphisms in alcohol dependence and their distribution among the Indian populations. Am J Drug Alcohol Abuse. 2013; 39:16–22. doi: 10.3109/00952990.2011.643991

33. Bhaskar LVKS, Thangaraj K, Kumar KP, Pardhasaradhi G, Singh L, Rao VR. Association between neuropeptide Y gene polymorphisms and alcohol dependence: A case-control study in two independent populations. Eur Addict Res. 2013; 19:307–13. doi: 10.1159/000346679. [

34. Sahni S, Tickoo M, Gupta R, Vaswani M, Ambekar A, Grover T, et al. Association of serotonin and GABA pathway gene polymorphisms with alcohol dependence: A preliminary study. Asian J Psychiatry. 2019; 39:169–73. doi: 10.1016/j.ajp.2018.04.023.

35. Prasad P, Ambekar A, Vaswani M. Case-control association analysis of dopamine receptor polymorphisms in alcohol dependence: A pilot study in Indian males. BMC Res Notes. 2013; 6:418. doi: 10.1186/1756-0500-6-418. doi: 10.1186/1756-0500-6-418.

36. Malhotra S, Basu D, Khullar M, Ghosh A, Chugh N. Candidate genes for alcohol dependence: A genetic association study from India. Indian J Med Res. 2016; 144:689–696. doi: 10.4103/ijmr.IJMR_1018_14.

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