International Journal of Research in Medical Sciences
Motlag MD et al. Int J Res Med Sci. 2025 Aug;13(8):3266-3269
www.msjonline.org
pISSN 2320-6071 | eISSN 2320-6012
DOI: https://dx.doi.org/10.18203/2320-6012.ijrms20252393

Original Research Article

Hypomagnesaemia in cases of alcohol use disorder: a cross-sectional study

Mrinalini D. Motlag, Azharuddin Rafique Patel*

Department of Medicine, Indira Gandhi Government Medical College, Nagpur, Maharashtra, India

Received: 27 May 2025
Revised: 04 July 2025
Accepted: 18 July 2025

***Correspondence:**
Dr. Azharuddin Rafique Patel,
E-mail: azpatel710@gmail.com

ABSTRACT

Background: Alcohol withdrawal syndrome is a frequent and life-threatening condition experienced in alcohol use disorder (AUD). Hypomagnesaemia has been commonly reported in cases of AUD. This study aims to estimate serum magnesium level in cases of AUD and to study its association with clinical presentations in tertiary care institute.
Methods: This is a cross-sectional study that involved 120 patients of AUD with various presentations and diagnosis of AUD was made using diagnostic and statistical manual of mental disorder, fifth edition (DSM-5) criteria. Severity of alcohol withdrawal was assessed with revised clinical institute withdrawal assessment for alcohol scale (CIWA-Ar). Serum magnesium was estimated using colorimetric end point method. Normal range of serum magnesium 1.46 to 2.68 mg/dl was taken.
Results: In this study the mean age of the subjects with AUD was 38.9±10.8 years and range 18 to 66 years. Males constitute 96.67% and females constitute 3.33%. Out of 120 cases we have observed 63.33% (76 cases) had normal magnesium level, while 36.67% (44 cases) had hypomagnesaemia. Serum magnesium in cases of AUD with withdrawal was significantly lower as compared to cases of AUD without withdrawal. The lowest level of serum magnesium was seen in patients with alcohol withdrawal with seizures.
Conclusions: Hypomagnesaemia was noted in about one-third cases of chronic AUD and serum magnesium was significantly decreased in cases presenting with alcohol withdrawal.

Keywords: Alcohol use disorder, Serum Magnesium, Alcohol withdrawal, Seizures

INTRODUCTION

Alcohol use disorder (AUD) is a medical condition characterized by an impaired ability to stop or control alcohol use despite adverse social, occupational, or health consequences.[1] The severity of AUD, as defined by the DSM 5, is determined by the number of diagnostic criteria met by an individual. Based on the total endorsed criteria, AUD is classified as mild (2-3 criteria), moderate (4-5 criteria), or severe (6 or more criteria).[2] AUD is commonly linked to a spectrum of electrolyte and micronutrient imbalances, such as acid-base disturbances (metabolic acidosis or alkalosis) and deficiencies including hypokalemia, hypernatremia, hypocalcaemia, hypomagnesaemia, and hypophosphatemia. Notably, hypomagnesaemia is frequently documented in chronic alcohol users.[3-5] Serum magnesium accounts for approximately 1% of the body's total magnesium content. In patients presenting to emergency care with a history of alcohol consumption, both total and ionized serum magnesium levels have been observed to be decreased. In chronic alcoholics, hypomagnesaemia may result from inadequate nutritional intake, secondary phosphate depletion, or alcohol-induced renal tubular dysfunction. This deficiency can manifest clinically as neuromuscular irritability, including symptoms such as seizures, tremors,

and limb weakness.[6-8] AUD prevalence was found to be varying from 11.2-42.9%.[5,9-11] The purpose of our study is to assess serum magnesium levels in AUD patients and to estimate prevalence of hypomagnesaemia, correlation of clinical presentations of AUD with serum levels of magnesium may offer insights in their management.

METHODS

This study was conducted in the department of general medicine at Indira Gandhi government medical college and hospital, Nagpur (Tertiary care institute) and this was approved by the institutional ethics committee for research. This was a observational cross sectional study conducted with sample size of 120 hospitalized patients of AUD who satisfying inclusion criteria of eligibility with DSM-5 criteria, males and females of age more than 18 years, who given informed consent and excluded the patients on diuretics/ proton pump inhibitor, patients of diabetes mellitus, chronic kidney disease, hepatic encephalopathy, myocardial infarction, cerebrovascular episode, pancreatitis, head injury, malabsorption syndrome, abdominal tuberculosis, chronic diarrhea. The period of study was from January 2023 to September 2024. Patients with alcohol withdrawal grouped into mild, moderate and severe withdrawal group according to CIWA-AR (revised clinical institute withdrawal assessment for alcohol scale) score. Blood samples were drawn and a panel of complete haemogram done. Serum magnesium was estimated using colorimetric end point method. Normal range of serum magnesium 1.46 to 2.68 mg/dL was taken.[12] The presentation of the categorical variables was done in the form of number and percentage (%). On the other hand, the quantitative data were presented as the means±SD and as median with 25th and 75th percentiles (interquartile range). The data normality was checked by using Shapiro-Wilk test. The cases in which the data was not normal, we used non parametric tests. The following statistical tests were applied for the results: 1) The association of the variables which were quantitative and not normally distributed in nature were analyzed using Kruskal Wallis test (for more than two groups)/Mann-Whitney test (for two groups) and variables which were quantitative and normally distributed in nature were analyzed using ANOVA (for more than two groups)/Independent t test (for two groups). 2) The association of the variables which were qualitative in nature were analyzed using Fisher's exact test as at least one cell had an expected value of less than 5.

The data entry was done in the Microsoft excel spreadsheet and the final analysis was done with the use of statistical package for social sciences (SPSS) software, IBM manufacturer, Chicago, USA, ver 25.0. For statistical significance, p value of less than 0.05 was considered statistically significant.

RESULTS

Out of 120 cases 116 were males and 4 were females with mean age of 38.9±10.8 years and range of 18 to 66 years. Other demographic details and clinical history are shown in Table 1. Severity of AUD according to DSM-5 criteria, 49 cases had mild AUD, 46 cases had moderate AUD and 25 cases had severe AUD as shown in Table 1. Among 120 cases of AUD, 38 cases were in withdrawal according to CIWA-Ar score and majority of cases were in moderate withdrawal (Table 2).

Serum magnesium (mg/dl) had mean value of 1.59±0.4, with median of 1.62 (1.212-1.89). In this study 76 (63.33%) cases had normal magnesium levels, 44 (36.67%) cases had hypomagnesaemia (Table 3). Serum magnesium also showed significant association ($p<0.0001$), with mean values decreasing from mild AUD (1.77 mg/dl) to moderate AUD (1.61 mg/dL) to severe AUD (1.22 mg/dl) as shown in Table 4. Mean±SD of serum magnesium (mg/dl) in cases of AUD in withdrawal was (1.38±0.44) which was significantly lower as compared to cases of AUD who were not in withdrawal 1.7±0.34 ($p=0.0002$) (Table 5).

Table 1: Demographic characteristics and clinical history.

Parameters		N	Percentage (%)
Age group (years)	18-20	2	1.67
	21-30	30	25
	31-40	39	32.50
	41-50	33	27.50
	51-60	12	10
	61-70	4	3.33
Gender	Female	4	3.33
	Male	116	96.67
Area of residence	Rural	35	29.17
	Urban	85	70.83
Education	Illiterate	1	0.83
	Primary to high school	29	24.17
	Secondary school	49	40.83
	Higher secondary	26	21.67
	Graduate	15	12.50
Marital status	Divorced	1	0.83
	Married	89	74.17
	Unmarried	30	25
Occupation	Clerical	16	13.33
	Non-clerical	104	86.67
Severity of AUD (score)	Mild (2-3)	49	40.83
	Moderate (4-5)	46	38.33
	Severe (6 or more)	25	20.83

Table 2: Distribution of severity of alcohol withdrawal according to CIWA-Ar score, (n=38).

CIWA-Ar score	N	Percentage (%)
Mild (≤8)	8	21.05
Moderate (9 to 15)	27	71.05
Severe (>15)	3	7.89

Table 3: Distribution of cases according to serum magnesium level.

Serum magnesium level (mg/dl)	N	Percentage (%)
Normal magnesium (1.46 to 2.68 mg/dl)	76	63.33
Hypomagnesaemia (<1.46 mg/dl)	44	36.67
Total	120	100

Table 4: Association of serum magnesium level (mg/dl) with severity of AUD.

Serum magnesium (mg/dl)	Mild AUD	Moderate AUD	Severe AUD	Total	P value
Mean±SD	1.77±0.34	1.61±0.39	1.22±0.29	1.59±0.4	
Median (25^{th}-75^{th} percentile)	1.77 (1.49-1.98)	1.66 (1.368-1.898)	1.12 (1.04-1.31)	1.62 (1.212-1.89)	<0.0001[§]
Range	1.03-2.56	0.98-2.43	0.9-2	0.9-2.56	

[§]ANOVA

Table 5: Comparison of serum magnesium (mg/dl) between cases of AUD in withdrawal and cases not in withdrawal.

Serum magnesium (mg/dl)	Alcohol withdrawal, (n=38)	Not in alcohol withdrawal, (n=82)	Total	P value
Mean±SD	1.38±0.44	1.7±0.34	1.59±0.4	
Median (25^{th}-75^{th} percentile)	1.13 (1.04-1.642)	1.68 (1.47-1.89)	1.62 (1.212-1.89)	0.0002[†]
Range	0.9-2.43	1-2.56	0.9-2.56	

[†]Independent t test

Proportion of patients with clinical presentation

AUD with acute gastritis, AUD with hypoglycemia, alcohol withdrawal with seizures and alcohol withdrawal without seizure had significant hypomagnesaemia (p=0.001).

Proportion of patients with clinical presentation

AUD with acute febrile illness, AUD with compensated alcoholic liver disease, AUD with severe anemia, AUD with unknown compound consumption had significantly higher normal magnesium levels. All cases of this study survived.

DISCUSSION

In this study the mean age of the subjects with AUD was 38.9±10.8 years and range 18 to 66 years. In this study, 70.83% (85 cases) were from urban and 29.17% (35 cases) were from rural population. In a study done by 9. Ayirolimeethal et al 93.3% cases from rural area and 6.7% from urban area. The severity of AUD is estimated according to DSM-5 criteria in which 40.83% cases belonged to mild category, 38.33% cases fall under moderate category and 20.83% cases were under severe AUD category. The severity of alcohol withdrawal is estimated with CIWA-Ar score, out of 120 cases, 31.66% (38 patients) were in withdrawal, 21.05% (8 patients) had mild withdrawal, 71.05% (27 patients) had moderate and 7.89% (3 patients) were in severe withdrawal. In study by Ayirolimeethal et al 20% cases had CIWA score 10 or more i.e. in moderate to severe withdrawal.[9] We have observed 63.33% (76 cases) had normal magnesium level, while 36.67% (44 cases) had hypomagnesaemia and there was no patient with hypermagnesaemia and mean magnesium level was 1.59±0.4 mg/dl. Serum magnesium also showed significant association (p<0.0001) with severity of AUD, with mean values of serum magnesium decreasing from mild (1.77 mg/dl) to moderate (1.61 mg/dl) to severe AUD (1.22 mg/dl). The lowest levels of serum magnesium were seen in patients with alcohol withdrawal with seizures (1.16±0.28) (p<0.0001). Mean±SD of serum magnesium (mg/dl) in cases of AUD in withdrawal (1.38±0.44 mg/dl) was significantly lower as compared to AUD without withdrawal (1.7±0.34) (p=0.0002). Elisaf et al studied total of 127 chronic alcoholic patients admitted and causes related to alcohol abuse were studied.[13] In this study hypomagnesaemia was the most common electrolyte disturbance observed in 29.9% patients. In study by Ayirolimeethal et al stated that 20% of the subjects had a low serum magnesium level on

admission.[9] In another study by Vatsalya et al concluded that low magnesium level were associated with AUD and appears to be associated even with mild liver injury and in this study, prevalence of hypomagnesaemia was 42.9%.[10] In study by Vanoni et al hypomagnesaemia was observed in 27% of patients.[5] In study by Hernández-Rubio et al the overall prevalence of serum hypomagnesaemia was 11.2%, with no gender differences.[11] A case control study by Enadle et al stated that on day of admission mean serum magnesium level in AUD cases was 1.54±0.25 mg/dl which was nearly consistent with my findings.[14] Another case control study by Ashalata et al magnesium levels were decreased in patients of chronic alcoholism with 1.5±0.09 mg/dl (mean±SD) when compared to controls with 2.2+0.21 mg/dl (mean±SD) with a statistically significant $p<0.0001$.[15]

Thus, the prevalence of hypomagnesaemia was varying across the several studies. Our cases were predominantly from urban area with 20.83% cases of severe AUD. About one third cases in our study were detected to have hypomagnesaemia.

Limitations

Nutritional status is often impaired in alcohol-use disorder and nutritional assessment of the cases was not done. Sample size of this study was small.

CONCLUSION

Hypomagnesaemia was noted in 36.67% cases of chronic AUD. Serum magnesium was significantly decreased in cases presenting with alcohol withdrawal. Serum magnesium was significantly lower in cases of alcohol withdrawal with seizures as against cases of alcohol withdrawal without seizures.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Understanding Alcohol Use Disorder | National Institute on Alcohol Abuse and Alcoholism (NIAAA). Available at: https://www.niaaa.nih.gov/publications/brochures-and-fact-sheets/understanding-alcohol-use-disorder. Accessed on 6 June 2025.
2. Loscalzo J, Fauci AS, Kasper DL, Hauser SL, Longo DL, Jameson JL, eds. Harrison's Principles of Internal Medicine. 21st edition. McGraw Hill. 2022;3556.
3. Stasiukyniene V. Blood plasma potassium, sodium and magnesium levels in chronic alcoholism during alcohol withdrawal. Med Kaunas Lith. 2002;38(9):892-5.
4. Baj J, Flieger W, Teresiński G, Grzegorz B, Ryszard S, Alicja F, et al. Magnesium, Calcium, Potassium, Sodium, Phosphorus, Selenium, Zinc, and Chromium Levels in Alcohol Use Disorder: A Review. J Clin Med. 2020;9(6):1901.
5. Vanoni FO, Milani GP, Agostoni C, Giorgio T, Pietro BF, Pietro C, et al. Magnesium Metabolism in Chronic Alcohol-Use Disorder: Meta-Analysis and Systematic Review. Nutrients. 2021;13(6):1959.
6. Ordak M, Maj-Zurawska M, Matsumoto H, Bujalska-Zadrozny M, Kieres-Salomonski I, Nasierowski T, et al. Ionized magnesium in plasma and erythrocytes for the assessment of low magnesium status in alcohol dependent patients. Drug Alcohol Depend. 2017;178:271-6.
7. Adewale A, Ifudu O. Kidney injury, fluid, electrolyte and acid-base abnormalities in alcoholics. Niger Med J J Niger Med Assoc. 2014;55(2):93-98.
8. Coregliano-Ring L, Goia-Nishide K, Rangel ÉB. Hypokalemia in Diabetes Mellitus Setting. Medicina (Mex). 2022;58(3):431.
9. Ayirolimeethal A, Jacob TR, George B, Kothamuttath P, Tharayil HM. Serum magnesium level and severity of delirium in alcohol withdrawal state. Open J Psychiatry Allied Sci. 2019;10(2):120.
10. Vatsalya V, Gala KS, Mishra M, Schwandt ML, Umhau J, Cave MC, et al. Lower Serum Magnesium Concentrations are associated With Specific Heavy Drinking Markers, Pro-Inflammatory Response and Early-Stage Alcohol-associated Liver Injury§. Alcohol Alcohol. 2020;55(2):164-70.
11. Hernández-Rubio A, Sanvisens A, Barbier-Torres L, Blanes R, Miquel L, Torrens M, et al. Associations of hypomagnesemia in patients seeking a first treatment of alcohol use disorder. Drug Alcohol Depend. 2023;245:109822.
12. Gragossian A, Bashir K, Bhutta BS, Friede R. Hypomagnesemia. In: StatPearls. StatPearls Publishing. 2024.
13. Elisaf M, Merkouropoulos M, Tsianos EV, Siamopoulos KC. Pathogenetic mechanisms of hypomagnesemia in alcoholic patients. J Trace Elem Med Biol Organ Soc Miner Trace Elem GMS. 1995;9(4):210-4.
14. Enadle R. A study of role of parental magnesium therapy in reducing the symptoms in chronic alcoholics. MedPulse-Int Med J. 2015;2(8):462-3.
15. Ashalata K, Kumari PK, Nagamani M, Kumari KL. Serum Magnesium and Other Electrolyte Levels in Chronic Alcoholic Patients in a Tertiary Mental Care Centre in North Coastal Andhra Pradesh India. IOSR J Dental Med Sci. 2015;14(5):35-7.

Cite this article as: Motlag MD, Patel AR. Hypomagnesaemia in cases of alcohol use disorder: a cross-sectional study. Int J Res Med Sci 2025;13:3266-9.