

**HIDDEN BURDEN OF HYPONATREMIA IN TORSEMIDE-PRESCRIBED PATIENTS:
AN OUTPATIENT-BASED STUDY AT IGMC SHIMLA**Dr. Kanika Khamb¹ and Dr. Mayank^{2*}¹Medical Officer, Department of Neurology, AIMSS, Shimla.²Junior Resident, Department of Medicine IGMC Shimla.

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ABSTRACT

Background: Torsemide is a loop diuretic widely used in outpatient management of heart failure, liver disease, and chronic kidney disease. It is associated with adverse effects, including hyponatremia. Understanding the prevalence and severity of this condition in the outpatient population is crucial for timely management. **Objectives:** To determine the prevalence and severity of hyponatremia in patients on torsemide therapy presenting to the Medicine OPD at IGMC Shimla and to identify associated risk factors. **Methods:** A cross-sectional study involving 150 adult patients taking torsemide for ≥ 2 weeks was conducted. Serum sodium levels were measured and categorized. Demographic, clinical, and therapeutic data were analyzed for associations. **Results:** Hyponatremia was observed in 54 (36%) of patients. Mild hyponatremia was the most common (25.3%), while moderate (8%) and severe (2.7%) forms were less frequent. Risk factors included older age, high torsemide dose, and comorbid heart failure. **Conclusion:** Hyponatremia, particularly in mild form, is common in outpatients on torsemide. Regular sodium monitoring and attention to dosage and comorbidities are essential to mitigate risks.

KEYWORDS: Hyponatremia, Torsemide, Prevalence, Loop Diuretic, IGMC Shimla, Outpatient.**INTRODUCTION**

Hyponatremia, defined as a serum sodium concentration below 135 mEq/L, is the most common electrolyte imbalance encountered in clinical practice, affecting up to 30% of hospitalized patients and a notable proportion of ambulatory individuals with chronic diseases.^[1] While its manifestations can range from asymptomatic laboratory abnormalities to severe neurological dysfunction, the impact of chronic, mild hyponatremia on morbidity—especially in the elderly and those with cardiovascular or renal disease—is now being increasingly recognized.^[2] Loop diuretics, such as torsemide, are cornerstone agents in the management of volume-overloaded states including heart failure, chronic kidney disease, liver cirrhosis, and resistant hypertension.^[3] Torsemide offers pharmacological advantages over furosemide, including better oral bioavailability, a longer half-life, and potentially antifibrotic cardiac effects.^[4] However, the diuretic-induced natriuresis and increased distal sodium delivery may lead to excessive free water retention and dilutional hyponatremia, particularly in predisposed individuals.^[5] The outpatient setting often lacks the electrolyte monitoring rigor of inpatient care. As such, patients with subclinical or evolving hyponatremia may go undetected until the onset of symptoms like fatigue, confusion, gait disturbances, or in severe cases, seizures and coma.^[6]

Several risk factors have been implicated, including advanced age, concurrent use of medications like SSRIs or thiazides, low dietary sodium intake, and higher diuretic doses.^[7,8] Previous studies have predominantly focused on hospitalized cohorts or intensive care patients, with limited data from Indian outpatient populations using torsemide. The hilly terrain and colder climate of Shimla may further influence fluid intake and sodium homeostasis, possibly impacting the epidemiology of diuretic-associated hyponatremia in this region. This study was undertaken to assess the prevalence and severity of hyponatremia in patients prescribed torsemide who present to the Medicine OPD of Indira Gandhi Medical College (IGMC), Shimla, and to identify potential clinical correlates and risk modifiers.

MATERIALS AND METHODS**Study Design and Setting**

A cross-sectional observational study was conducted from October 2023 to February 2024 in the Medicine OPD of Indira Gandhi Medical College (IGMC), Shimla.

Inclusion Criteria

- Age ≥ 18 years
- On torsemide for ≥ 2 weeks

Exclusion Criteria

- Known chronic hyponatremia before torsemide use
- Concurrent use of other hyponatremia-inducing drugs
- Acute illness, hospitalization, or dialysis

Sample Size

150 patients were included through convenience sampling. Based on a previous study by Chatterjee *et al.* (2014)^[1], the prevalence of hyponatremia in heart failure patients on diuretics was approximately 33%. The sample size was calculated based on the formula for estimating a single proportion in a cross-sectional study. Thus, the minimum required sample size was approximately 340. However, due to time constraints and limited OPD turnout during the winter months in Shimla, a feasible sample size of 150 patients was enrolled using convenience sampling. While this reduced statistical power to detect smaller differences, it was considered adequate for identifying overall prevalence and trends within this population.

Data Collection

Structured proforma used to collect: Demographics (age, sex, BMI), Torsemide dosage and duration, Indication for use, Comorbidities, Serum sodium (classified as): Mild: 130–134 mEq/L, Moderate: 125–129 mEq/L, Severe: <125 mEq/L

Ethical Considerations and Consent

- All participants were enrolled only after obtaining written informed consent in their local language.
- Participants were assured of confidentiality and their right to withdraw at any point without affecting their standard of care.
- Those found to have significant hyponatremia were managed appropriately and referred for further care if necessary.

Statistical Analysis

Data was entered into Microsoft Excel and analyzed using SPSS Version 25.0. Descriptive statistics were presented as mean \pm standard deviation for continuous variables and percentages for categorical variables. Associations between categorical variables were analyzed using the Chi-square test, and a p-value <0.05 was considered statistically significant.

RESULT

A total of 150 patients on torsemide therapy presenting to the Medicine OPD of IGMC Shimla were enrolled in the study. The mean age of the participants was 61.2 ± 12.5 years, with the majority belonging to the age group of 60–79 years (44.7%). Of the total population, 87 (58%) were male and 63 (42%) were female, reflecting a mild male predominance (Table 1).

Table 1: Demographic profile of study population.

Variable	Frequency (n)	Percentage (%)
Age Group (years)		
18–39	12	8.0
40–59	38	25.3
60–79	67	44.7
≥ 80	33	22.0
Gender		
Male	87	58.0
Female	63	42.0
Comorbidities/Indications		
Heart Failure	81	54.0
Chronic Liver Disease	27	18.0
Chronic Kidney Disease (Stage 1–3)	24	16.0
Hypertension	18	12.0
Torsemide Dose		
≤ 10 mg/day	41	27.3
11–20 mg/day	68	45.4
>20 mg/day	41	27.3
Duration of Torsemide Use		
1–4 weeks	29	19.3
1–3 months	61	40.7
>3 months	60	40.0
Dietary Salt Restriction		
Yes	48	32.0
No	102	68.0

The most common indication for torsemide use was heart failure (54%), followed by chronic liver disease (18%), chronic kidney disease (16%), and hypertension (12%).

Most patients were on low to moderate doses of torsemide (10–20 mg/day), while 27.3% were on doses >20 mg/day (table 1).

Hyponatremia was detected in 54 out of 150 patients, giving a prevalence of 36%. Among these, mild hyponatremia (serum sodium 130–134 mEq/L) was most common, accounting for 38 patients (25.3%), while moderate hyponatremia (125–129 mEq/L) was seen in 12

patients (8%), and severe hyponatremia (<125 mEq/L) was observed in only 4 patients (2.7%). The remaining 96 patients (64%) had normal serum sodium levels (≥ 135 mEq/L) (Fig 1).

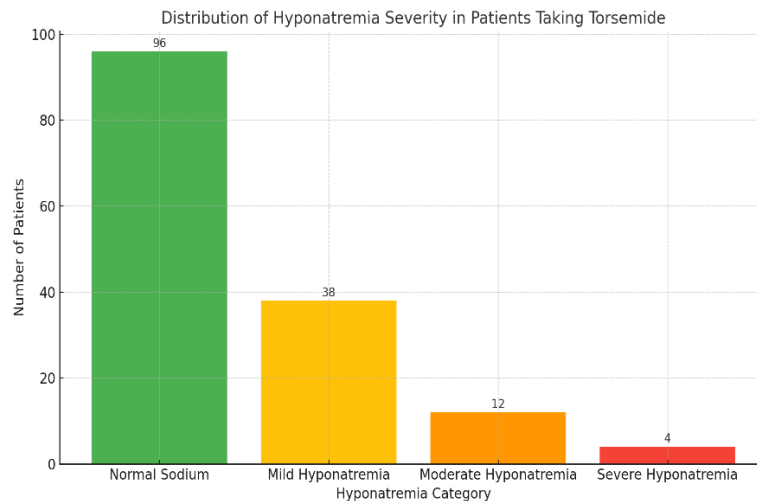


Fig. 1: Distribution of Hyponatremia in patient taking torsemide according to severity of hyponatremia.

The prevalence of hyponatremia was higher in older age groups, with 52.1% of those aged ≥ 70 years affected, compared to only 22.7% in those below 50 years. A significant association was found between age and hyponatremia ($p < 0.01$). Additionally, patients with chronic heart failure had the highest incidence of hyponatremia (42.6%), followed by those with chronic liver disease (33.3%). The relationship between underlying comorbidity and serum sodium level was statistically significant ($p < 0.05$).

Higher doses of torsemide were also linked to greater hyponatremia prevalence: 18 out of 41 patients (43.9%) on doses >20 mg/day had low serum sodium levels, compared to 36 out of 109 patients (33%) on ≤ 20 mg/day. Although this trend did not reach statistical significance, it suggested a dose-related effect.

Furthermore, females had a slightly higher risk of hyponatremia (39.7%) than males (33.3%), though the difference was not statistically significant ($p = 0.34$). Dietary salt restriction, reported in 48 patients, was associated with a higher prevalence of hyponatremia (47.9% vs. 29.3%; $p = 0.02$), indicating that excessive salt restriction could be a contributory factor in outpatient settings.

No cases of symptomatic seizures or acute neurological deterioration due to hyponatremia were noted. However, 11 patients with moderate to severe hyponatremia reported fatigue, dizziness, or mild confusion, prompting further clinical management.

DISCUSSION

In this cross-sectional outpatient study, the prevalence of hyponatremia among patients on torsemide was found to

be 36%, with mild hyponatremia (25.3%) comprising the majority of cases. The occurrence of moderate (8%) and severe hyponatremia (2.7%) was significantly lower, aligning with previous findings that outpatient hyponatremia tends to be less severe than in hospitalized patients.^[9,10] Our results are consistent with those of Filippatos *et al.*, who reported hyponatremia in 35–40% of chronic heart failure patients on loop diuretics, with a predominance of mild cases.^[11] Similarly, Chatterjee *et al.* in a South Indian study found 33% prevalence of hyponatremia in heart failure patients, with diuretic use as a key modifiable factor.^[12] However, most of these studies were conducted in inpatient or mixed populations, underscoring the importance of data from OPD settings like ours. Older age, presence of heart failure, and higher torsemide doses (>20 mg/day) were significantly associated with hyponatremia. Aging kidneys have a diminished capacity to excrete free water, increasing susceptibility to dilutional hyponatremia.^[13] Furthermore, patients with heart failure often experience neurohormonal activation (e.g., increased ADH and RAAS activity), which potentiates water retention and exacerbates sodium dilution even with relatively low doses of diuretics.^[14] Though torsemide is sometimes preferred over furosemide for its pharmacologic benefits, including less frequent dosing and a longer duration of action, it still shares the fundamental mechanism that predisposes to sodium loss—namely, inhibition of the Na-K-2Cl symporter in the thick ascending loop of Henle.^[15] The predominance of mild hyponatremia in this cohort is clinically important. Even mild reductions in serum sodium have been linked to increased risks of falls, fractures, cognitive impairment, and mortality, especially in the elderly.^[16,17] Importantly, mild hyponatremia may remain unrecognized in OPD settings due to nonspecific symptoms like fatigue or

lightheadedness. Timely monitoring of serum sodium levels and individualized diuretic titration could help prevent the progression to more severe electrolyte derangements. Educating patients regarding adequate fluid and salt intake, especially during colder months in Shimla, may also prove beneficial.

LIMITATIONS

This study is limited by its cross-sectional nature, lack of follow-up data, and exclusion of hospitalized and critically ill patients. It also did not assess concurrent drug use (e.g., SSRIs, ACE inhibitors) or urinary sodium/osmolality levels, which could help distinguish dilutional from depletion hyponatremia.

Future longitudinal studies are needed to examine the temporal evolution of hyponatremia in torsemide users and to evaluate the effectiveness of different management strategies, including dose adjustment, salt supplementation, or switching to non-loop diuretics.

CONCLUSION

Mild hyponatremia is a common yet often unnoticed complication in patients on torsemide therapy. Severe cases are relatively rare but can be life-threatening if not addressed. Clinicians should remain vigilant in monitoring electrolytes, especially in the elderly and heart failure populations.

CONFLICT OF INTEREST

None declared.

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