INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

OPEN ACCESS

Case Study

Lithium Induced Nephrogenic Diabetes Insipidus in a Bipolar Disorder Patient

Alvina Christiana B.*, Jona Joy, Shanila Thankam Suresh, Nandini Goswami

Doctor Of Pharmacy, Department of Pharmacy Practice, Krupanidhi College of Pharmacy Bangalore Karnataka 560035.

ARTICLE INFO

Published: 7 Nov 2025
Keywords:
severe polyuria, polydipsia, and hypernatremia
DOI:
10.5281/zenodo.17552534

ABSTRACT

Nephrogenic diabetes insipidus (NDI) is an uncommon but serious side effect of long-term lithium treatment, which is frequently used to treat bipolar disorder. Lithium disrupts the expression of aquaporin-2 in the collecting ducts, which impedes the renal concentrating mechanism and makes it difficult for the kidney to respond to antidiuretic hormone. A 45-year-old lady with a history of bipolar disorder who was treated with lithium carbonate and experienced severe polyuria, polydipsia, and hypernatremia is presented. A water deprivation test confirmed lithium-induced NDI, and the diagnostic examination showed low urine osmolality, high serum sodium, and normal renal function. Within two weeks, there was a noticeable improvement in the patient's condition after the lithium was stopped right away and amiloride and thiazide diuretics were started. This instance emphasizes the necessity of routine renal monitoring for mental health patients on long-term lithium treatment. To avoid irreversible renal impairment, lithium-induced NDI must be identified and treated as soon as possible. The cornerstones of good care include patient education, the use of epithelial sodium channel blockers, and the therapeutic removal of lithium.

INTRODUCTION

One of the most important pharmaceutical treatments for bipolar affective disorder is still lithium carbonate. Chronic exposure is linked to a number of detrimental renal consequences, including nephrogenic diabetes insipidus (NDI), which affects roughly 10% to 15% of individuals undergoing long-term medication, despite its therapeutic effectiveness[1,2]. Lithium causes NDI by reducing the reactivity of the renal collecting ducts to vasopressin, mainly via disrupting cyclic AMP signalling and lowering the expression of aquaporin-2 channels[3].The kidney's incapacity to concentrate urine as a result of this pathological

***Corresponding Author:** Alvina Christiana B.
Address: *Doctor Of Pharmacy, Department of Pharmacy Practice, Krupanidhi College of Pharmacy Bangalore Karnataka 560035.*
Email ✉: alvinachristiana0@gmail.com
Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

interference causes polyuria, polydipsia, and, in extreme situations, hypernatremia.

Even though minor polyuria is commonly seen when using lithium, clinically substantial NDI can cause increasing dehydration and irreversible renal impairment if left untreated. Regular renal function monitoring is essential due to the mild early signs and sneaky start. A high index of suspicion is necessary for the diagnosis of NDI, especially in individuals who exhibit increased thirst and urine production without other metabolic abnormalities[4]. Maintaining the lowest effective lithium dosage, being properly hydrated, and co-administering amiloride to high-risk patients are preventive measures[5]. If identified early and treated quickly, lithium-induced renal abnormalities can be partially reversed. Thus, long-term renal function can be preserved and the development of chronic kidney disease (CKD) effectively prevented with prompt diagnosis, education, and therapeutic interventions[6,7].

Case Presentation

A 45-year-old lady with a 10-year history of bipolar disorder who was taking 900 mg of lithium carbonate daily reported experiencing polyuria, polydipsia, nocturia, and nonspecific exhaustion for three months. She denied having recent manic episodes or using diuretics. Upon examination, her vital signs were steady, she was alert, and she was somewhat dehydrated. Laboratory tests showed urine osmolality of 120 mOsm/kg, serum osmolality of 305 mOsm/kg, and serum sodium of 156 mEq/L. The serum lithium level was within the therapeutic range at 0.8 mmol/L. Renal parameters and blood glucose levels were normal. The inability to concentrate urine during a water deprivation test confirmed nephrogenic diabetes insipidus. Lithium was immediately phased out. The patient was prescribed a thiazide diuretic to paradoxically decrease urine production and amiloride 10 mg daily to stop additional lithium uptake through epithelial sodium channels. She received advice on limiting her sodium intake and staying well hydrated. Serum salt levels returned to normal within two weeks, and polyuria significantly decreased. After a month, she was still asymptomatic and her renal function was stable. Following drug discontinuation and focused treatment, clinical improvement confirmed the diagnosis of lithium-induced NDI.

Management Of ADR

Preventive surveillance, pharmacological correction, early detection, and timely lithium withdrawal are the mainstays of managing lithium-induced nephrogenic diabetic insipidus (NDI). Because prolonged exposure to lithium prolongs renal tubular damage, stopping lithium use right once is the first and most important approach. If chronic fibrosis has not yet occurred, early withdrawal may result in a partial or total reversal of the concentration deficiency. The goals of pharmacological management are to avoid dehydration and lessen polyuria. The preferred medication is amiloride, a potassium-sparing diuretic, which reduces additional nephrotoxicity by blocking lithium entrance through the epithelial sodium channel (ENaC) in the collecting duct's main cells. It is safe to use with thiazide diuretics, which increase proximal tubular water reabsorption by paradoxically reducing urine volume through modest extracellular fluid contraction. These substances frequently work in concert to reduce urine production. These medications have a protective renal impact when stopping lithium is not practical because of mental dependence.

Strict monitoring of fluid intake and output, routine serum electrolyte measurements, and counselling to maintain proper oral hydration are all examples of non-pharmacological therapy.

Restricting salt intake (less than 100 mEq/day) improves the antidiuretic effect of thiazides. Renal function and electrolyte balance must be carefully monitored every 4-6 weeks. Using the lowest effective dose of lithium, keeping serum levels within the therapeutic range (0.6–1.0 mmol/L), and thinking about once-daily dosing to allow for renal recovery intervals are all examples of preventive methods. Early diagnosis of renal abnormalities requires routine monitoring of urine specific gravity, electrolytes, and serum creatinine. Alternative mood stabilizers such valproate or lamotrigine may be used for those who have growing renal impairment or repeated episodes.In the end, safe long-term management is ensured by psychiatry and nephrology working together as a multidisciplinary team. For prompt intervention and the avoidance of irreversible nephropathy, patient education about the identification of signs such as increased thirst and polyuria is still essential.

DISCUSSION

A well-known renal side effect of lithium is nephrogenic diabetes insipidus (NDI), which is mostly caused by lithium interfering with the kidney's water reabsorption processes. Long-term exposure to lithium reduces the collecting ducts' reactivity to vasopressin via interfering with cyclic adenosine monophosphate (cAMP) signalling pathways and downregulating aquaporin-2 (AQP2) water channels. Polyuria and polydipsia are clinical manifestations of excessive water loss caused by this dysfunction. A lesser percentage of people with lithium experience severe NDI, which is frequently correlated with treatment duration, serum concentration, and cumulative dosage, even though minor urinary frequency is common among these patients. Because amiloride directly blocks the entry of lithium into primary cells through the epithelial sodium channel (ENaC), it limits intracellular buildup and subsequent nephrotoxicity, making it a preferred pharmaceutical intervention. Contrary to popular belief, thiazide diuretics increase proximal tubular sodium and water reabsorption while encouraging mild volume contraction, which lowers urine volume. Reversing tube dysfunction requires stopping lithium use, however continuous exposure may result in partial improvement because of irreversible structural damage. The case study highlights the significance of prompt diagnosis and therapeutic adjustment, which can result in both biochemical and symptomatic recovery. Preventing such consequences requires therapeutic lithium levels to be maintained and regular renal monitoring.

CONCLUSION

The need for clinical monitoring in patients receiving long-term lithium medication is highlighted by this example. Despite being rare, nephrogenic diabetes insipidus presents a serious risk of renal morbidity if left undiagnosed. The instance highlights that toxicity is not only concentration-dependent but also relates to cumulative exposure and individual sensitivity, as lithium-induced NDI can appear even at therapeutic serum concentrations. Prompt diagnosis can be facilitated by early detection using routine renal tests, including serum electrolyte, urine osmolality, and lithium levels. To decrease urine production and lessen renal stress, management techniques should place a high priority on stopping lithium whenever possible and starting pharmacologic medications like amiloride and thiazide diuretics. Comprehensive management necessitates multidisciplinary care coordination between psychiatry and nephrology, adequate hydration, and dietary sodium control. Patients who are informed about early indications, such as excessive urination or persistent thirst, are

better equipped to seek medical help before irreparable harm is done. In conclusion, clinicians must weigh the potential hazards to the kidneys against the therapeutic benefits of lithium, which is still a useful mood stabilizer in bipolar illness. The incidence of lithium-induced NDI can be significantly reduced by cautious dose control, prophylactic co-medication, and periodic renal function monitoring. It is possible to simultaneously achieve psychiatric stability and renal function recovery with prompt identification and customized management, guaranteeing the best long-term results.

Conflicts Of Interest

The authors declare no conflict of interests.

Authors Contribution

All authors have contributed equally to this work and have read and approved the final version of the manuscript.

REFERENCES

1. Grünfeld, J. P., & Rossier, B. C. (2009). Lithium nephrotoxicity revisited. Kidney International, 76(1), 8–14. https://doi.org/10.1038/ki.2009.118
2. Bedford, J. J., et al. (2008). Lithium-induced nephrogenic diabetes insipidus: renal effects of amiloride. Clinical Journal of the American Society of Nephrology, 3(5), 1324–1331. https://doi.org/10.2215/CJN.00880208
3. Boton, R., Gaviria, M., & Batlle, D. C. (1987). Prevalence, pathogenesis, and treatment of renal dysfunction associated with chronic lithium therapy. American Journal of Kidney Diseases, 10(5), 329–345. https://doi.org/10.1016/S0272-6386(87)80124-6
4. Kwon, T. H., Frokiaer, J., & Nielsen, S. (2013). Regulation of aquaporin-2 in the kidney: a molecular mechanism of body-water homeostasis. Kidney Research and Clinical Practice, 32(3), 96–102. https://doi.org/10.1016/j.krcp.2013.07.002
5. Berl, T. (2008). Impact of solute intake on urine flow and water excretion. Journal of the American Society of Nephrology, 19(6), 1076–1078. https://doi.org/10.1681/ASN.2008010049
6. Gitlin, M. (2016). Lithium side effects and toxicity: prevalence and management strategies. International Journal of Bipolar Disorders, 4(1), 27. https://doi.org/10.1186/s40345-016-0068-y
7. Shine, B., et al. (2015). Long-term effects of lithium on renal, thyroid, and parathyroid function: a retrospective analysis of laboratory data. The Lancet, 386(9992), 461–468. https://doi.org/10.1016/S0140-6736(14)61842-0.

HOW TO CITE: Alvina Christiana B.*, Jona Joy, Shanila Thankam Suresh, Nandini Goswami, Lithium Induced Nephrogenic Diabetes Insipidus in a Bipolar Disorder Patient, Int. J. of Pharm. Sci., 2025, Vol 3, Issue 11, 1141-1144 https://doi.org/10.5281/zenodo.17552534