**International Journal of Medical and Pharmaceutical Research**

Online ISSN-2958-3683 | Print ISSN-2958-3675
Frequency: Bi-Monthly
Available online on: https://ijmpr.in/

Original Article

# Thyroid Dysfunction During Active Disease in Pediatric Nephrotic Syndrome: A Case Series and Clinical Management Approach

**Dr. Khurshed Alam Choudhury[1], Dr. Kanak Lata Yadav[2], Dr. Harun Siddiqui[3]**

*[1] Department of Pediatrics, United Institute of Medical Sciences, Prayagraj, Uttar Pradesh, India.*
*[2] Department of Pediatrics, Dr. Ram Manohar Lohia Institute of Medical Sciences, Lucknow, Uttar Pradesh, India.*
*[3] Department of Pediatrics, Era's Lucknow Medical College and Hospital, Lucknow, India.*



**Corresponding Author:**

**Dr. Khurshed Alam Choudhury**
Department of Pediatrics, United Institute of Medical Sciences, Prayagraj, Uttar Pradesh, India.

*Received: 15-01-2026*
*Accepted: 10-02-2026*
*Available online: 19-02-2026*



## ABSTRACT

**Background**: Nephrotic syndrome (NS) in children is associated with several extrarenal complications, including thyroid dysfunction. Urinary losses of thyroid hormones and thyroid binding proteins during active disease may result in subclinical or overt hypothyroidism.
**Case presentation**: We report a case series of three children with nephrotic syndrome admitted in January 2025, April 2025, and January 2026 who developed thyroid dysfunction during the active phase of nephrotic syndrome. Baseline clinical characteristics and thyroid function parameters before treatment and after remission are summarized in Table 1.
**Results**: Two children had subclinical hypothyroidism, while one had overt hypothyroidism with clinical symptoms. Subclinical hypothyroidism resolved spontaneously following remission of nephrotic syndrome, whereas overt hypothyroidism required temporary levothyroxine therapy. Thyroid function normalized in all children after achievement of remission.
**Conclusion**: Thyroid dysfunction in pediatric nephrotic syndrome is often transient and closely related to disease activity.

***Keywords***: *Nephrotic syndrome, Thyroid dysfunction, Subclinical hypothyroidism, Overt hypothyroidism, Proteinuria, Pediatric nephrology.*

## INTRODUCTION

Nephrotic syndrome (NS) is one of the most common glomerular disorders in childhood and is characterized by heavy proteinuria, hypoalbuminemia, edema, and hyperlipidemia.[1,6] In addition to renal manifestations, children with NS are susceptible to a range of extrarenal complications that may influence growth, metabolism, and overall well-being.[1,6]

Thyroid dysfunction is a recognized but often under-appreciated complication of pediatric NS. Loss of thyroid hormones and thyroid-binding proteins in the urine during active disease can lead to biochemical abnormalities ranging from subclinical hypothyroidism to overt hypothyroidism. These abnormalities frequently parallel disease activity and may resolve following remission, suggesting a functional and potentially reversible process rather than intrinsic thyroid disease.[2-4]

Despite increasing recognition, uncertainty remains regarding optimal screening strategies and management of thyroid dysfunction in children with NS. While some patients remain asymptomatic with transient biochemical changes, others may develop clinically significant hypothyroidism requiring treatment. Kidney Disease: Improving Global Outcomes (KDIGO) guidelines emphasize reassessment of biochemical abnormalities after remission before instituting long-term therapy, underscoring the need for an individualized and conservative approach.[1]

We report a case series of three children with nephrotic syndrome who developed thyroid dysfunction during periods of active disease. This series highlights the observed clinical patterns, therapeutic considerations, and patient outcomes, and

emphasizes a structured, evidence-based approach to the evaluation and management of thyroid dysfunction in pediatric nephrotic syndrome.

**Case Series**

**Case 1**

A 5-year-old female was admitted in January 2025 with generalized edema and reduced urine output for 5 days. Physical examination revealed periorbital puffiness and bilateral pedal edema, without hypertension or systemic illness. Laboratory evaluation showed nephrotic-range proteinuria (urine protein 4+), serum albumin 1.8 g/dL, and hypercholesterolemia. Renal function tests were within normal limits.

She was diagnosed with a first episode of steroid-sensitive nephrotic syndrome and commenced on oral prednisolone according to standard pediatric protocols. Thyroid function testing revealed an elevated TSH of 8.6 mIU/L with normal free T4, consistent with subclinical hypothyroidism. Anti-thyroid peroxidase antibodies were negative.

In the absence of clinical features of hypothyroidism, thyroid hormone replacement was deferred. The child achieved remission of proteinuria within 3 weeks, following which repeat thyroid function testing showed normalization of TSH levels, confirming transient thyroid dysfunction.

**Case 2**

A 4-year-old male was admitted in April 2025 with relapse of nephrotic syndrome, presenting with facial edema, ascites, and scrotal swelling. He had a history of frequent relapses over the preceding year. Laboratory investigations confirmed heavy proteinuria, serum albumin of 1.6 g/dL, and normal renal function.

Thyroid evaluation revealed a TSH level of 14.2 mIU/L with low free T4, indicative of overt hypothyroidism. The child exhibited clinical features including lethargy and poor appetite. Thyroid autoantibodies were negative.

He was treated with oral prednisolone for relapse and initiated on levothyroxine replacement. Thyroid function gradually improved over 6 weeks. Levothyroxine was continued until sustained remission of nephrotic syndrome was achieved and thyroid function normalized, after which replacement therapy was discontinued.

**Case 3**

An 8-year-old male presented in January 2026 with his first episode of nephrotic syndrome, characterized by generalized edema and weight gain. Laboratory evaluation showed urine protein 3+, serum albumin 2.0 g/dL, and hyperlipidemia. He responded to standard prednisolone therapy, achieving remission within 4 weeks.

Screening thyroid tests revealed a TSH of 9.8 mIU/L with normal free T4, consistent with subclinical hypothyroidism. The child was asymptomatic, with no goiter and negative thyroid antibodies. He was managed conservatively with close observation. Repeat thyroid function testing after remission demonstrated normalization of TSH levels.

**Table 1** Clinical characteristics and thyroid function before treatment and after remission in children with nephrotic syndrome

| **Characteristic** | **Case 1** | **Case 2** | **Case 3** |
|---|---|---|---|
| Age (years) / Sex | 5 / Female | 4 / Male | 8 / Male |
| Admission date | January 2025 | April 2025 | January 2026 |
| Clinical presentation | Generalized edema, oliguria | Facial edema, ascites, scrotal edema | Generalized edema, weight gain |
| Nephrotic syndrome status | First episode | Frequent relapser | First episode |
| Urine protein (dipstick)* | 4+ | 4+ | 3+ |
| Serum albumin (g/dL) | 1.8 | 1.6 | 2.0 |
| Serum cholesterol | Elevated | Elevated | Elevated |
| Renal function | Normal | Normal | Normal |
| **Thyroid function – pre-treatment** | | | |
| TSH (mIU/L) | 8.6 | 14.2 | 9.8 |
| Free T4 | Normal | Low | Normal |
| Thyroid autoantibodies† | Negative | Negative | Negative |
| Thyroid status | Subclinical hypothyroidism | Overt hypothyroidism | Subclinical hypothyroidism |
| Thyroid-related symptoms | Absent | Lethargy, poor appetite | Absent |
| **Management** | | | |

| | | | |
|---|---|---|---|
| Treatment for nephrotic syndrome | Oral prednisolone | Oral prednisolone | Oral prednisolone |
| Thyroid hormone replacement | Not required | Levothyroxine | Not required |
| **Thyroid function – post-remission** | | | |
| Time to reassessment | 4 weeks | 6 weeks | 4 weeks |
| TSH (mIU/L) | Within reference range | Within reference range | Within reference range |
| Free T4 | Normal | Normal | Normal |
| Final thyroid outcome | Transient dysfunction | Reversible hypothyroidism | Transient dysfunction |
| Outcome of nephrotic syndrome | Steroid-sensitive remission | Remission after relapse treatment | Steroid-sensitive remission |

**Footnotes**
* Urine protein was assessed by dipstick analysis on a spot urine sample.
† Thyroid autoantibodies refer to anti–thyroid peroxidase antibodies.
Post-remission thyroid function tests were performed after achievement of clinical and biochemical remission of nephrotic syndrome.
**Abbreviations:** TSH, thyroid-stimulating hormone; T4, thyroxine.

## DISCUSSION

Thyroid dysfunction in children with nephrotic syndrome represents a functional and potentially reversible endocrine abnormality that closely parallels disease activity.[2-4] This case series highlights thyroid dysfunction as a clinically relevant comorbidity that arises during periods of active proteinuria and resolves following remission. In all three children, thyroid abnormalities were detected exclusively during active nephrotic syndrome and normalized after remission, reinforcing the transient nature of this condition.

In accordance with Kidney Disease: Improving Global Outcomes (KDIGO) guidance, management of pediatric nephrotic syndrome should extend beyond control of proteinuria to include identification and appropriate management of extrarenal complications that may influence overall health and recovery.[1] Clinical practice principles support reassessment of biochemical abnormalities after achievement of remission before initiating long-term therapy. This approach is particularly relevant to thyroid dysfunction in nephrotic syndrome, where abnormalities often arise from urinary loss of thyroid hormones and thyroid-binding proteins during active proteinuria rather than from intrinsic thyroid disease. [2-4]

### Pathophysiological basis and implications for management

The primary mechanism underlying hypothyroidism in nephrotic syndrome is urinary loss of thyroid hormones and thyroid-binding proteins, including thyroxine-binding globulin, transthyretin, and albumin. This leads to reduced circulating thyroid hormone levels and compensatory elevation of thyroid-stimulating hormone (TSH). The severity of thyroid dysfunction has been shown to correlate with the degree of proteinuria, hypoalbuminemia, and duration of active disease.[2-4]

This pathophysiology distinguishes thyroid dysfunction associated with nephrotic syndrome from autoimmune hypothyroidism and has important implications for management. Treatment decisions should therefore be guided by the severity of biochemical abnormalities, presence of clinical symptoms, and the likelihood of reversibility following remission.

### Screening and monitoring considerations

Although universal thyroid screening is not mandated for all children with nephrotic syndrome, increasing evidence supports targeted evaluation during active disease. Thyroid function testing is particularly advisable in children with severe hypoalbuminemia, prolonged nephrotic states, frequent relapses, or poor response to steroid therapy. Initial evaluation typically includes serum TSH and free thyroxine (T4), with thyroid autoantibodies measured when abnormalities are detected to exclude autoimmune thyroid disease.[5]

A structured clinical approach supports reassessment of thyroid function following remission, as resolution of proteinuria is frequently associated with spontaneous normalization of thyroid abnormalities.[2-4] Routine long-term thyroid function monitoring may not be necessary in children whose thyroid function normalizes and who remain in sustained remission.

### Management of subclinical hypothyroidism

Subclinical hypothyroidism, defined by elevated TSH with normal free T4 levels,[7] was the most common abnormality observed in this series, consistent with previous pediatric reports.[2-4] Current endocrine guidelines do not recommend routine

treatment of asymptomatic biochemical thyroid abnormalities unless they are clinically significant or persistent. Both the American Thyroid Association guidelines for hypothyroidism and the European Thyroid Association guidelines on subclinical hypothyroidism support observation with repeat assessment in cases of mild TSH elevation, reserving treatment primarily for patients with TSH ≥10 mIU/L, progressive abnormalities, or clinical symptoms.[5,9] Accordingly, children with subclinical hypothyroidism in our series were managed conservatively with observation alone, and thyroid function normalized following remission without hormone replacement.

**Management of overt hypothyroidism**

Overt hypothyroidism, characterized by elevated TSH and low free T4 levels, represents a clinically significant condition warranting treatment, particularly when accompanied by symptoms such as lethargy, poor appetite, or growth impairment.[8] Contemporary nephrology and endocrine guidelines emphasize treatment of comorbid conditions when they contribute to clinical symptoms or metabolic instability, while avoiding unnecessary intervention for mild or transient biochemical abnormalities. In the context of thyroid dysfunction, overt hypothyroidism warrants prompt levothyroxine therapy, whereas mild subclinical abnormalities may be managed with observation and repeat assessment unless persistent or clinically significant.[5,9,10] In our series, the child with overt hypothyroidism was treated with levothyroxine in parallel with standard nephrotic syndrome therapy, consistent with American Thyroid Association recommendations.[5]

Levothyroxine dosing may require individualization during active proteinuria due to ongoing urinary hormone losses. Close biochemical monitoring is essential, with reassessment after remission. In many cases, thyroid hormone replacement can be tapered and discontinued once sustained remission is achieved and thyroid function normalizes, highlighting the reversible nature of this condition.

**Integration with nephrotic syndrome management**

Effective control of nephrotic syndrome remains the cornerstone of managing associated thyroid dysfunction. Steroid-induced remission typically results in restoration of normal thyroid hormone levels. In children with frequently relapsing or steroid-dependent disease, prolonged or recurrent proteinuria may predispose to repeated thyroid dysfunction, necessitating periodic reassessment.

**Limitations and Future Research**

The small sample size limits generalizability and precludes estimation of prevalence or identification of risk factors. Thyroid function was assessed at discrete time points, and serial measurements during prolonged proteinuria were not performed. Total thyroid hormone levels and thyroid-binding globulin were not measured, limiting mechanistic interpretation.

The duration of follow-up in our series was limited, precluding assessment of long-term outcomes, including the potential effects of recurrent transient hypothyroidism on growth and neurodevelopment. Larger, prospective studies are warranted to clarify optimal screening intervals, treatment thresholds, dosing strategies, and long-term clinical outcomes, while supporting an individualized and comprehensive approach to patient care.

## REFERENCES


1. Kidney Disease: Improving Global Outcomes (KDIGO) Glomerular Diseases Work Group (2021) KDIGO clinical practice guideline for the management of glomerular diseases. *Kidney Int* 100(Suppl):S1–S276
2. Jung SH, Lee JE, Chung WY. Changes in the thyroid hormone profiles in children with nephrotic syndrome. Korean J Pediatr. 2019 Mar;62(3):85–9. doi: 10.3345/kjp.2018.06891.
3. Iglesias P, Diez JJ. Thyroid dysfunction and kidney disease. Eur J Endocrinol. 2009 Apr;160(4):503–15. doi: 10.1530/EJE-08-0837.
4. Mattoo TK. Hypothyroidism in infants with nephrotic syndrome. Pediatr Nephrol. 1994 Dec;8(6):657–9. doi: 10.1007/BF00869078.
5. Jonklaas J, Bianco AC, Bauer AJ, et al. (2014) Guidelines for the treatment of hypothyroidism. *Thyroid* 24:1670–1751
6. Eddy AA, Symons JM (2003) Nephrotic syndrome in childhood. *Lancet* 362(9384):629–639. https://doi.org/10.1016/S0140-6736(03)14184-0
7. Wassner AJ, Smith JR. Nelson Textbook of Pediatrics. 21st ed. Philadelphia (US): Elseiver; 2020. Hypothyroidism; pp. 2914-22. https://www.google.com.np/books/edition/Nelson_Textbook_of_Pediatrics/LJuRDwAAQBAJ?hl=en
8. Vol 5 Issue 6 p.6-7 | American Thyroid Association. (2016). American Thyroid Association. https://www.thyroid.org/patient-thyroid-information/ct-for-patients/vol-5-issue-6/vol-5-issue-7/
9. Pearce SHS, Brabant G, Duntas LH, et al. 2013 ETA Guideline: Management of Subclinical Hypothyroidism. *Eur Thyroid J.* 2013;2:215–228. https://doi.org/10.1159/000356507
10. National Kidney Foundation. (2002). KDOQI clinical practice guidelines for chronic kidney disease: Evaluation, classification, and stratification. American Journal of Kidney Diseases, 39(2 Suppl 1), S1–S266.