Medical science of Uzbekistan
published: 24 December 2025
Received: 26 November 2025
Accepted: 20 October 2025
Published: 24 December 2025
doi.org/10.56121/2181-3612-2025-6-79-82
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Article/Original paper

INFLUENCE OF THYROID HORMONAL IMBALANCE ON THE SEVERITY OF NEPHROTIC SYNDROME IN CHILDREN

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Abstract.

Relevance. Nephrotic syndrome (NS) in children is a common kidney disorder often associated with immune and endocrine imbalance. Thyroid hormone changes may affect NS pathogenesis, clinical manifestations, and treatment response. Purpose of the study Evaluation of the effect of thyroid dysfunction on the clinical manifestations of NS in children. **Materials and methods of the study.** Eighty children (1–18 years) with NS and 30 healthy controls were studied. According to serum TSH, T3, and T4, patients were divided into groups with normal thyroid function, hypothyroidism, and hyperthyroidism. Clinical, biochemical, ultrasound, and immunological parameters were evaluated. **Research results.** Subclinical hypothyroidism was common in active NS. In hypothyroid patients, edema lasted longer, hypoproteinemia, hypercholesterolemia, and proteinuria were more severe ($p<0,05$), with frequent relapses and corticosteroid dependence. **Conclusion.** Thyroid dysfunction increases NS severity. Regular thyroid evaluation and endocrinologist involvement are crucial in pediatric management.

Key words: nephrotic syndrome, thyroid dysfunction, children, hypothyroidism, proteinuria.

Introduction. Nephrotic syndrome (NS) is one of the most common glomerular pathologies in children, characterized by proteinuria, hypoalbuminemia, edema, and hyperlipidemia [1]. NS is a significant nephrological problem in the pediatric population, as it is characterized by a high recurrence rate and variable response to treatment [2]. In recent years, much attention has been paid to the role of immunological and endocrine imbalances in the pathogenesis of NS [3]. In particular, thyroid hormones (thyroxine - T4, triiodothyronine - T3, and thyroid-stimulating hormone - TSH) play an important role in the regulation of metabolism, bone and muscle tissue development, as well as the function of the immune system [4]. During proteinuria, the urinary loss of thyroid hormones and thyroxine-binding globulin can lead to endocrine imbalances [5]. Clinical observations indicate that thyroid dysfunction, mainly subclinical or clinical hypothyroidism, is frequently observed in children with NS [6]. These changes affect not only metabolic homeostasis, but also the clinical course of nephrotic syndrome. For example, hypothyroidism has been shown to prolong edema, increase hypoproteinemia and hyperlipidemia, and prolong proteinuria [7]. At the same time, thyroid dysfunction is considered one of the factors determining the response of NS to therapy. Several studies have shown that in hypofunction, there is a high incidence of corticosteroid dependence and resistance [8]. Therefore, regular monitoring of thyroid status in children with NS and the determination of treatment tactics with the participation of an endocrinologist are of great importance. The aim of this study was to assess the impact of thyroid dysfunction on the clinical manifestations of nephrotic syndrome in children.

Materials and methods: The study included a total of 80 patients aged 1-18 years with a diagnosis of nephrotic form of Chronic Glomerulonephritis, treated in the Nephrology Department of the Andijan Regional Children's Multidisciplinary Medical Center during 2023-2025, of whom 32 (40.0%) were children with normal thyroid function, 48 with thyroid dysfunction (hypothyroidism - 38 (47.5%), hyperthyroidism - 10 (12.5%)), and 30 healthy children as a control group. Examinations: The following examinations were performed on all participants - clinical analyzes: complete blood and urine

tests; Biochemical blood analysis: albumin, total protein, cholesterol, triglycerides, creatinine, urea; Thyroid hormones: TSH, total and free T3, T4 (by immunoenzyme analysis); Immunological tests: circulating immune complexes, complement components C3 and C4; Instrumental examinations: thyroid gland and kidney ultrasound. Clinical evaluation The following clinical parameters were evaluated in patients: duration of edema syndrome; duration of proteinuria and number of relapses; response to therapy (sensitivity, dependence and resistance to corticosteroids). Statistics: SPSS 26.0 program, χ^2-test, Student t-test and Pearson correlation methods were used. Significance $p<0.05$.

Results. The average age of 110 children (80 in the NS group, 30 in the control group) was 9.8 ± 3.6 years. Gender composition: boys - 61 (55.4%), girls - 49 (44.6%). Patients did not differ statistically from the control group in terms of age and gender ($p>0.05$) (Table 1).

Table 1

Distribution of children participating in the study by age and gender (n=110)

Indicators	Nephrotic syndrome group (n=80)	Control group (n=30)	P-value
Age (years, M±SD)	9.8 ± 3.6	9.5 ± 3.4	>0.05
Boys, n (%)	45 (56.3%)	16 (53.3%)	>0.05
Girls, n (%)	35 (43.7%)	14 (46.7%)	>0.05
Duration of illness (years)	2.4 ± 1.1	–	–

In the patients with nephrotic form of chronic glomerulonephritis, the duration of edema syndrome was significantly longer in the hypothyroidism group (mean 16.4 ± 3.2 days), compared to 9.7 ± 2.5 days in the normothyroidism group ($p<0.05$). The duration of proteinuria was also longer in the hypothyroidism group (21.8 ± 4.1 days) compared to the control group (12.5 ± 3.4 days, $p<0.05$) (Fig. 1).

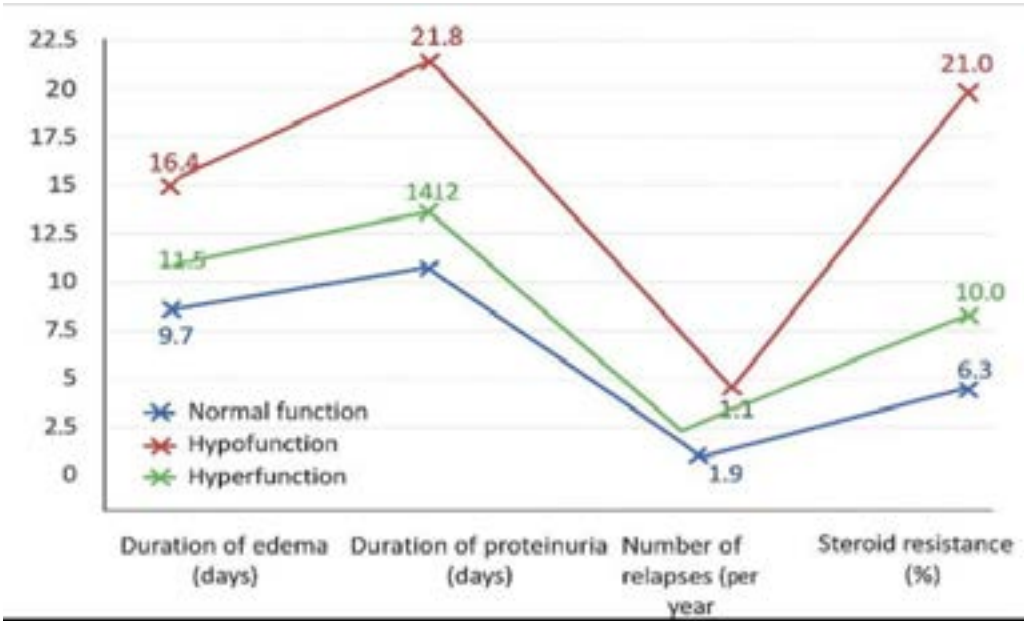

Figure 1. Clinical manifestations in patients participating in the study (n=80).

The biochemical, immunological, clinical and therapeutic results in the group of patients and healthy children were as follows (Table 2).

According to the data in Table 2, we conclude that thyroid dysfunctions are closely related to the severity of the disease, increased relapse rates, steroid dependence, and resistance in children with nephrotic syndrome. Therefore, regular monitoring of thyroid function in such patients and the inclusion of an endocrinological approach in complex therapy are important.

Table-2

Clinical, laboratory and therapeutic indicators in children with nephrotic syndrome in thyroid dysfunction (n=110)

Indicators	Control group (n=30)	Normal thyroid function (n=32)	Hypothy-roidism (n=38)	Hyperthy-roidism (n=10)	p-value
Albumin (g/l)	38,6 ± 2,8	27,5 ± 3,6	21,3 ± 4,2	26,8 ± 3,9	<0.01
Cholesterol (mmol/l)	4,2 ± 0,9	6,5 ± 1,1	8,9 ± 1,3	5,1 ± 1,0	<0.01
Creatinine (μmol/L)	65,4 ± 8,7	67,1 ± 9,2	69,3 ± 10,1	68,7 ± 9,6	>0.05
Urea (mmol/l)	4,8 ± 0,7	5,0 ± 0,9	5,2 ± 1,0	5,1 ± 0,8	>0.05
C3 (g/l)	1,25 ± 0,18	1,20 ±0,20	0,82 ± 0,16	1,05 ± 0,17	<0.05
C4 (g/l)	0,32 ± 0,06	0,30 ± 0,05	0,21 ± 0,04	0,26 ± 0,05	<0.05
Corticosteroid sensitivity (%) Albumin (g/l)	–	81,3	55,2	70,0	χ^2=4.56; p=0.03
Recidivism (average/ year)	–	1,9 ± 0,8	3,1 ± 1,2	2,4 ± 0,9	<0.05
Steroid dependence (%)	–	18,8	39,5	20,0	<0.05
Steroid resistance (%)	–	6,3	21,0	10,0	<0.05

Discussion.

The results of this study showed a close biological and clinical relationship between the clinical course of nephrotic syndrome (NS) in children and the state of thyroid function. In our study, subclinical or clinical hypothyroidism was noted in almost half of patients with NS [9,10]. According to our data, in the case of hypofunction, edema syndrome persists longer, hypoproteinemia and hyperlipidemia are more pronounced, and proteinuria is prolonged. In particular, in the studies of a number of scientists, the clinical course of NS is associated with hormonal imbalance, and thyroid dysfunction leads to a pronounced and prolonged clinical course of the disease [11]. Analysis of immunological parameters revealed a decrease in the complement system (C3 and C4) and an increase in circulating immune complexes in the hypofunction group. This suggests that thyroid hormones play an important role in the regulation of the immune system [9]. Also, our study found that patients with hypothyroidism had a low sensitivity to corticosteroids, a high incidence of steroid dependence and resistance, which is consistent with the results of other studies [10]. Thus, the results of this study confirm that thyroid dysfunction is closely related to the clinical severity, duration and resistance to therapy of nephrotic syndrome in children. Taking this into account, it is necessary to regularly assess the thyroid status of each patient with NS and develop a comprehensive treatment strategy with the participation of an endocrinologist.

Conclusion.

The results of this study showed that the clinical course of nephrotic syndrome in children is closely related to the state of thyroid function. Patients with thyroid hypofunction had a longer duration of edema and proteinuria, more pronounced hypoproteinemia and hyperlipidemia, an increased number of relapses, and a higher incidence of steroid resistance. Compared with the normofunction and hyperfunction groups, the hypofunction state was characterized by a more severe course of nephrotic syndrome and a lower response to therapy.

The data obtained confirm the participation of thyroid dysfunction as an important modifying factor in the pathogenesis of nephrotic syndrome and the clinical significance of the endocrine-immunological interaction.

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