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Original Research Article

Study on Thyroid Profile in Children with Systemic Lupus Erythematosus at a Tertiary Care Hospital

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Abstract:

Background: Systemic lupus erythematosus (SLE) is a chronic autoimmune disorder associated with multiple organ manifestations, including thyroid dysfunction. Thyroid abnormalities may contribute to additional morbidity in children with SLE.

Aim: To assess the spectrum of thyroid profile abnormalities among children with systemic lupus erythematosus at a tertiary care hospital.

Materials and Methods: This hospital-based observational study included 93 children with SLE at Indira Gandhi Institute of Child Health, Bengaluru, over 18 months. Thyroid function tests, anti-thyroid peroxidase (anti-TPO), and anti-thyroglobulin (anti-TG) antibodies were assessed. Disease activity was evaluated using SLEDAI scores. Statistical analysis was performed using SPSS, with $p < 0.05$ considered significant.

Results: Thyroid dysfunction was identified in 40 (43.1%) children. Overt hypothyroidism was observed in 16.1%, euthyroid sick syndrome in 15.2%, and subclinical hypothyroidism in 11.8%. Anti-TPO and anti-TG antibody positivity were detected in 35.4% and 25.8%, respectively. No significant association was observed between thyroid status and SLEDAI score ($p = 0.267$).

Conclusion: Thyroid dysfunction and thyroid autoimmunity were common among children with SLE, particularly hypothyroidism. Routine clinical evaluation and appropriate thyroid screening may facilitate early identification and management of associated thyroid abnormalities.

Keywords: Systemic lupus erythematosus; Thyroid dysfunction; Pediatric SLE; Hypothyroidism; Thyroid autoimmunity; Anti-TPO; SLEDAI.

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Introduction

Systemic lupus erythematosus (SLE) is a chronic multisystem autoimmune disorder characterized by the production of autoantibodies, immune complex deposition, and inflammatory damage involving multiple organs. Childhood-onset SLE often follows a more aggressive course than adult-onset disease, with greater disease activity and organ involvement.

Thyroid dysfunction is increasingly recognized as an important endocrine manifestation of SLE, primarily due to shared autoimmune mechanisms and immune dysregulation. A systematic review by Li et al. highlighted the increased risk of thyroid abnormalities among patients with SLE, emphasizing the relationship between systemic autoimmunity and thyroid dysfunction.[1] Thyroid abnormalities in pediatric SLE include overt hypothyroidism, subclinical hypothyroidism, autoimmune thyroiditis, hyperthyroidism, and euthyroid sick syndrome. Shamma et al. reported a considerable prevalence of thyroid dysfunction among children with SLE, supporting the importance of thyroid screening in this population.[2]

Similarly, Konte et al. identified thyroid dysfunction and Hashimoto's thyroiditis in childhood-onset SLE, highlighting the potential role of autoimmune mechanisms.[3] Autoimmune thyroid disease is characterized by the presence of anti-thyroid peroxidase (anti-TPO) and anti-thyroglobulin (anti-TG) antibodies. Na-Nan et al. demonstrated an association between SLE and thyroid autoimmunity, suggesting that thyroid abnormalities may coexist with systemic autoimmune manifestations.[4] Nishat et al. further emphasized the clinical relationship between SLE and thyroid disorders, particularly hypothyroidism and autoimmune thyroiditis.[5]

The pathogenesis of thyroid dysfunction in SLE involves genetic susceptibility, altered immune tolerance, B-cell activation, and autoantibody production. Athanassiou et al. described the complex relationship between thyroid disease and SLE, emphasizing the importance of recognizing thyroid abnormalities during disease management.[6] Childhood-onset SLE presents additional challenges because endocrine dysfunction may adversely affect growth, pubertal development, metabolism, and overall quality of life. Syverson highlighted the importance of comprehensive evaluation and multidisciplinary management in children with SLE.[7]

Despite increasing evidence regarding thyroid abnormalities in SLE, pediatric data, particularly from India, remain limited. Early identification of thyroid dysfunction may facilitate timely intervention and reduce associated morbidity. Therefore, the present study was undertaken to evaluate the spectrum of thyroid dysfunction and thyroid autoantibody abnormalities among children with SLE attending a tertiary care hospital.

Materials and Methods

Study Design and Setting: This hospital-based observational study was conducted at the Indira Gandhi Institute of Child Health, Bengaluru, Karnataka, over a period of 18 months.

Study Population and Sample Size: A total of 93 children aged below 18 years diagnosed with systemic lupus erythematosus according to the Systemic Lupus International Collaborating Clinics (SLICC) classification criteria were included.

The sample size was estimated using a mean TSH level of 3.24 mIU/L, standard deviation of 1.47, 95% confidence level, and absolute precision of 0.3. The calculated minimum sample size was 93 children.

Inclusion Criteria: Children below 18 years fulfilling the SLICC classification criteria for SLE whose parents or legally authorized representatives provided written informed consent were included. Assent was obtained from children older than 12 years.

Exclusion Criteria: Children with previously diagnosed thyroid dysfunction who were already receiving treatment for thyroid disorders were excluded.

Data Collection and Clinical Assessment: After obtaining institutional ethical approval and informed consent, demographic characteristics, medical history, disease duration, clinical manifestations, and anthropometric measurements were recorded using a structured proforma. Disease activity was assessed using the Systemic Lupus Erythematosus Disease Activity Index (SLEDAI).

Laboratory investigations included complete blood count, erythrocyte sedimentation rate, C-reactive protein, renal and liver function tests, antinuclear antibodies, anti-double-stranded DNA antibodies, and complement levels.

Thyroid Profile Assessment: Thyroid function was evaluated by measuring serum thyroid-stimulating hormone (TSH), total triiodothyronine (T3), total thyroxine (T4), free T3, and free T4. Thyroid autoimmunity was assessed using anti-TPO and anti-TG antibodies measured by electrochemiluminescence immunoassay.

Based on thyroid function results, participants were categorized as euthyroid, overt hypothyroid, subclinical hypothyroid, hyperthyroid, or having euthyroid sick syndrome. Anti-TPO levels above 34 IU/mL and anti-TG levels above 115 IU/mL were considered elevated according to the study's laboratory reference limits.

Statistical Analysis: Data were analyzed using the Statistical Package for the Social Sciences (SPSS).

Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. Pearson's Chi-square test was used to assess associations between categorical variables, and Spearman's correlation was applied where appropriate. A p-value <0.05 was considered statistically significant.

Ethical Considerations: The study was conducted following approval from the Institutional Ethics Committee. Written informed consent was obtained from parents or legally authorized representatives, and assent was obtained from eligible children. Participant confidentiality was maintained throughout the study.

Results

The present hospital-based observational study included 93 children with systemic lupus erythematosus (SLE) attending Indira Gandhi Institute of Child Health, Bengaluru. The mean age of participants was 13.33 ± 3.13 years, with the

majority belonging to the 10–15-year age group (53.8%). Female predominance was observed, with 85 (91.4%) girls and 8 (8.6%) boys. The duration of disease was up to 12 months in 50.5% of children. Thyroid dysfunction was identified in 40 (43.1%) participants, with overt hypothyroidism being the most common abnormality.

Table 1: Demographic and Clinical Characteristics of Children with SLE (N = 93)

Parameter	Frequency (n)	Percentage (%)
Age group (years)		
5–10	14	15.1
10–15	50	53.8
15–18	29	31.1
Gender		
Female	85	91.4
Male	8	8.6
Duration of SLE		
≤12 months	47	50.5
12–24 months	22	23.7
>24 months	24	25.8
SLEDAI disease activity		
Low	14	15.1
Moderate	60	64.5
High	19	20.4
Clinical characteristics		
Acute cutaneous lupus	51	54.8
Oral ulcers	25	26.9
Synovitis	26	28.0
Renal involvement	35	37.6
Goitre	7	7.5

Mean age: 13.33 ± 3.13 years; mean SLEDAI score: 9.55 ± 4.89.

The majority of children demonstrated moderate disease activity (64.5%), followed by high disease activity (20.4%). Acute cutaneous manifestations were observed in 54.8% of participants, while renal involvement was present in 37.6%. Clinically detectable goitre was uncommon, affecting only 7.5% of children.

Table 2: Distribution of Thyroid Dysfunction and Thyroid Autoantibodies among Children With SLE (N = 93)

Thyroid parameter	Frequency (n)	Percentage (%)
Thyroid functional status		
Euthyroid	53	56.9
Overt hypothyroidism	15	16.1
Subclinical hypothyroidism	11	11.8
Euthyroid sick syndrome	14	15.2
Hyperthyroidism	0	0.0
Overall thyroid dysfunction	**40**	**43.1**
Anti-TPO antibodies		
Normal	60	64.6
Elevated	33	35.4
Anti-TG antibodies		
Normal	69	74.2
Elevated	24	25.8
Goitre		
Present	7	7.5
Absent	86	92.5

Anti-TPO: anti-thyroid peroxidase; Anti-TG: anti-thyroglobulin.

Thyroid dysfunction was observed in 43.1% of children. Overt hypothyroidism was the most frequent abnormality (16.1%), followed by euthyroid sick syndrome (15.2%) and subclinical hypothyroidism (11.8%). No cases of hyperthyroidism were identified. Elevated anti-TPO antibodies were detected in 35.4% of children, while anti-TG positivity was observed in 25.8%, indicating a considerable burden of thyroid autoimmunity.

Table 3: Association between Thyroid Status and SLE Disease Activity (N = 93)

Thyroid status	Low SLEDAI n (%)	Moderate SLEDAI n (%)	High SLEDAI n (%)	Total (n)
Overt hypothyroidism	3 (20.0)	11 (73.3)	1 (6.7)	15
Subclinical hypothyroidism	2 (18.2)	9 (81.8)	0 (0.0)	11
Euthyroid sick syndrome	3 (21.4)	9 (64.3)	2 (14.3)	14
Euthyroid	8 (15.1)	29 (54.7)	16 (30.2)	53
Total	**16 (17.2)**	**58 (62.4)**	**19 (20.4)**	**93**

Statistical analysis reported in the thesis: $\chi^2 = 9.972$; $p = 0.267$ (not significant).

Among children with overt hypothyroidism, 73.3% had moderate disease activity, while 81.8% of those with subclinical hypothyroidism belonged to the moderate SLEDAI category. However, the association between thyroid functional status and disease activity was not statistically significant ($p = 0.267$), suggesting that thyroid dysfunction was not significantly associated with SLEDAI categories in this cohort.

Table 4: Association of Thyroid Parameters with Disease Activity and Clinical Characteristics

Parameter evaluated	Chi-square (χ^2)	p-value	Statistical significance
Thyroid status vs. SLEDAI score	9.972	0.267	Not significant
TSH status vs. SLEDAI score	1.712	0.425	Not significant
Anti-TPO status vs. SLEDAI score	0.097	0.953	Not significant
Anti-TG status vs. SLEDAI score	1.585	0.453	Not significant
Thyroid status vs. age group	9.810	0.279	Not significant
Thyroid status vs. gender	1.719	0.787	Not significant
Thyroid status vs. anti-dsDNA status	4.115	0.391	Not significant

No statistically significant associations were reported between thyroid status and SLEDAI score, age, gender, or anti-dsDNA antibody status. Similarly, TSH abnormalities and anti-thyroid antibody positivity were not significantly associated with disease activity. These findings suggest that thyroid abnormalities may occur independently of the measured clinical and immunological indicators of SLE activity.

Overall, the study demonstrated a high prevalence of thyroid dysfunction and thyroid autoantibody positivity among children with SLE, with hypothyroidism representing the predominant functional abnormality.

Discussion

The present study evaluated thyroid function and thyroid autoimmunity among 93 children with systemic lupus erythematosus (SLE). Thyroid dysfunction was identified in 43.1% of participants, with overt hypothyroidism (16.1%) being the most common abnormality, followed by euthyroid sick syndrome (15.2%) and subclinical hypothyroidism (11.8%). These findings highlight the considerable burden of thyroid abnormalities in pediatric SLE and support the importance of evaluating thyroid function in affected children.

The high prevalence of thyroid dysfunction may be attributed to shared autoimmune mechanisms involving altered immune regulation and autoantibody production. Ferrari et al. described the association between SLE and thyroid autoimmunity, emphasizing the contribution of common immunological pathways.[9] Similar observations were reported by Chaudhary et al., who identified thyroid dysfunction and thyroid autoantibody positivity among children with SLE.[10] Eberhard et al. also demonstrated thyroid abnormalities in pediatric SLE, supporting the possibility of concurrent autoimmune thyroid disease.[11]

In the present study, overt hypothyroidism was the predominant thyroid abnormality. Autoimmune destruction of thyroid tissue and impaired thyroid hormone synthesis may contribute to hypothyroidism in patients with SLE. Weetman highlighted the immunological mechanisms underlying Hashimoto's thyroiditis, particularly lymphocytic infiltration and thyroid-specific autoantibody production.[12] Ralli et al. and Ragusa et al. similarly described the importance of immune dysregulation in the development and progression of autoimmune hypothyroidism.[13,14]

A marked female predominance was observed, with 91.4% of participants being girls. This finding is consistent with the established epidemiological characteristics of SLE, which predominantly affects females, particularly during adolescence. The classification criteria described by Aringer et al. and Petri et al. emphasize the heterogeneous clinical and immunological manifestations of SLE.[15,16] Levy and Kamphuis further highlighted the increased disease burden and aggressive clinical presentation of childhood-onset SLE.[17]

Elevated anti-TPO antibodies were detected in 35.4% of children, while anti-TG antibodies were elevated in 25.8%. These findings suggest

considerable thyroid autoimmunity, even in the absence of clinically apparent thyroid disease. Tomer described the genetic and epigenetic mechanisms contributing to autoimmune thyroid disorders, which may explain the coexistence of thyroid autoimmunity and SLE.[18]

No cases of hyperthyroidism were identified in the present cohort. Although hyperthyroidism is a recognized manifestation of autoimmune thyroid disease, its occurrence appears less frequent than hypothyroidism in this study population. Ross et al. provided diagnostic guidance for identifying hyperthyroidism and differentiating its underlying causes.[19]

The association between thyroid status and SLEDAI score was not statistically significant ($p = 0.267$). Similarly, thyroid abnormalities were not significantly associated with age, gender, anti-dsDNA positivity, or anti-thyroid antibody status in the reported analyses.

These findings suggest that thyroid dysfunction may coexist with SLE without a consistent relationship to disease activity. Experimental evidence concerning autoimmune thyroiditis, including the immune-inflammatory pathways investigated by Shen et al., further supports the complex immunological mechanisms underlying thyroid disease.[20]

The present study emphasizes the importance of thyroid function assessment in children with SLE.

However, its single-center observational design, absence of a healthy control group, and lack of longitudinal follow-up limit causal interpretation and generalizability. Larger multicenter prospective studies are required to establish the relationship between thyroid dysfunction, thyroid autoimmunity, and SLE disease activity.

Conclusion

Thyroid dysfunction was observed in 43.1% of children with systemic lupus erythematosus, with overt hypothyroidism being the most common abnormality, followed by euthyroid sick syndrome and subclinical hypothyroidism. Elevated anti-TPO and anti-TG antibodies were detected in 35.4% and 25.8% of children, respectively, indicating a considerable burden of thyroid autoimmunity. No statistically significant association was observed between thyroid dysfunction and SLE disease activity or other evaluated clinical parameters. These findings support incorporating thyroid function assessment into the clinical evaluation and follow-up of children with SLE to facilitate early detection and appropriate management of thyroid abnormalities.

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