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Research Article

# Thyroid Disorders in Children in a Resource-Limited Country: A Descriptive Study from 2019 to 2024

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## Abstract

Introduction: The incidence of thyroid disorders in the pediatric population in Senegal is poorly known. The aim of our study was to contribute to a better understanding of the characteristics of these conditions in our setting. Methods: We conducted a descriptive cross-sectional study over a 30-month period. All patients aged 0 to 17 years followed for thyroid disorders were included. Data were collected using a survey form, entered in Microsoft Excel 2019, and analyzed with EPI Info version 7.1. Results: We collected data on 125 patients. Thyroid dysfunctions accounted for 62.8% of patients followed for endocrine disorders (excluding diabetes). The majority were female (68.8%) with a mean age at diagnosis of 8.9 years. Graves' disease was the most common diagnosis (81.6%) with a female predominance (67.6%). A neonatal form was observed in 4%. The mean age at diagnosis was 9.88 years. Goiter was the most frequent sign (89.1%). TSH receptor antibodies (TRAb) were positive in most patients (96.3%). Congenital hypothyroidism had a prevalence of 5.6%, with a mean age at diagnosis of 1.82 years. Three-quarters (75%) of patients had psychomotor developmental delay. Umbilical hernia was the most frequent sign (57.14%) in congenital hypothyroidism. Levothyroxine was used at an average dose of 6.9 µg/kg/day. Persistent hypothyroidism was found in 80% of cases. Other thyroid conditions included Hashimoto's thyroiditis (4%), thyroid nodules (4%), and one case of subacute thyroiditis. Conclusion: Graves' disease was the most common diagnosis. These findings underscore the importance of early diagnosis and structured follow-up to prevent long-term complications.

## Keywords

Thyroid, Children, Senegal

## 1. Introduction

Thyroid disorders include hyperthyroidism, hypothyroidism, thyroid nodules, and thyroid cancers. Their epidemiology is poorly understood and varies significantly, particularly in children [1]. This variability is due to differences in study populations, their genetic backgrounds, and environmental factors, notably changes in iodine intake [1]. Hyperthyroidism

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is defined as the uncontrolled overproduction of thyroid hormones [2]. It affects 1–2% of the general population and is considered rare and severe in children. It represents a public health issue due to its psychosomatic impact [3]. The most common cause is Graves' disease, an autoimmune condition resulting from the stimulation of thyrotropin receptors by autoantibodies [4]. In addition to hyper- and hypothyroidism, thyroid disorders also include nodules and thyroid cancers. Thyroid nodules are among the most frequently encountered endocrine conditions, with prevalence increasing with age [5].

In our setting, where pediatric endocrinology is a newly developing specialty, thyroid disorders have received limited research attention. For this reason, we initiated this study with the following objectives:

1) To determine the prevalence of various thyroid disorders in children.
2) To describe the characteristics of these conditions in our local context.

## 2. Methods

We conducted a descriptive cross-sectional study over a period of 30 months. All patients aged 0 to 17 years who were being followed for a thyroid disorder in the pediatrics department of Abass Ndao Hospital were included. The study involved patient records from 2019 to 2024. Data were collected using a standardized survey form. They were entered into Microsoft Excel 2019 and analyzed using EPI Info version 7.1. The variables studied included sociodemographic, clinical, biological, and follow-up data.

## 3. Results

Thyroid dysfunctions accounted for 62.8% of patients followed for endocrine disorders (excluding diabetes). Most patients were female (68.8%), and the average age at diagnosis was 8.9 years. Parental consanguinity was observed in 78.23%, and a family history of thyroid dysfunction was found in nearly a quarter of cases (24.39%) (Table 1). The most common reasons for consultation were anterior cervical swelling, exophthalmos, weight loss, and palpitations. Clinically, at the time of diagnosis, most patients were in a state of hyperthyroidism (86%), 10% in hypothyroidism, and 4% were euthyroid. The etiologies were mainly dominated by Graves' disease (81.6%); other causes represented around 5% (Figure 1). All etiologies showed a female predominance (68.8%). The average age at diagnosis, across all conditions, was 8.9 years. Hyperthyroidism was represented by Graves' disease and neonatal hyperthyroidism. Graves' disease accounted for 81.6% of cases. The average age at diagnosis was 9.88 years, and most patients were between 9 and 12 years old (Figure 2). Goiter was the most frequent clinical sign (89.1%), followed by tachycardia (61.4%) and exophthalmos (49.5%). Advanced linear growth was noted in 21% of patients (Figure 3). Puberty was normal in 93.1% of cases, while pubertal delay was found in 6.9%.

***Table 1.*** *Characteristics of patients followed for thyroid dysfunction.*

| Parameters | Number (%) |
|---|---|
| Gender (N = 125) | |
| - Girls | 86 (68.8%) |
| - Boys | 39 (31.2%) |
| School attendance (n = 107) | |
| - Attending school | 89 (83.18%) |
| - Not attending school | 18 (16.82%) |
| Geographic origin (n = 54) | |
| - Urban | 32 (59.26%) |
| - Rural | 22 (40.74%) |
| Socioeconomic level (n = 124) | |
| - High | 18 (14.52%) |
| - Medium | 66 (52.2%) |
| - Low | 40 (32.26%) |
| Parental consanguinity (n = 124) | |
| - Absent | 97 (78.23%) |
| - First-degree | 6 (4.83%) |
| - Second-degree | 21 (16.94%) |
| Family history of thyroid dysfunction (n = 123) | |
| - Present | 30 (24.39%) |
| - Absent | 93 (75.61%) |

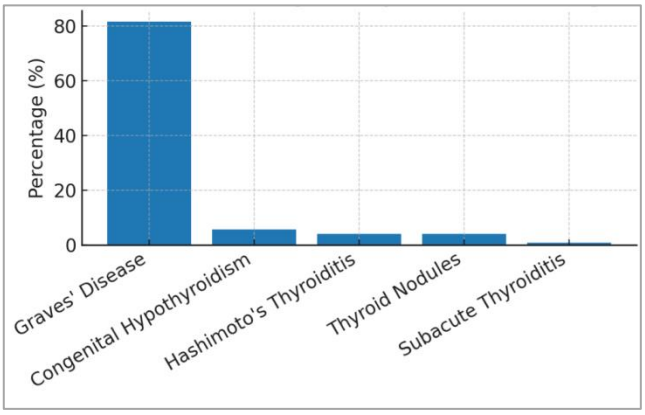


***Figure 1.*** *Distribution of thyroid dysfunction etiologies.*

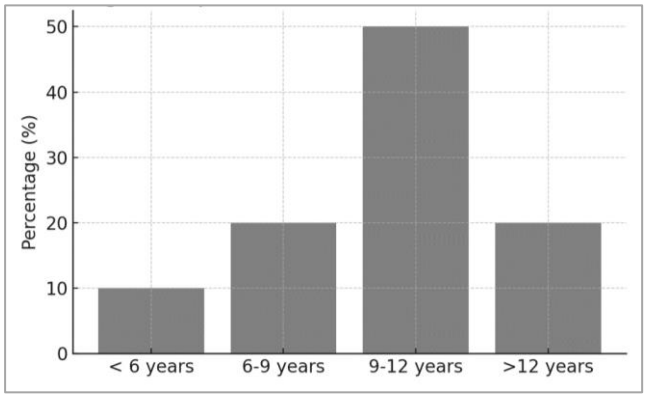


***Figure 2.*** *Age groups of patients with Graves' disease.*

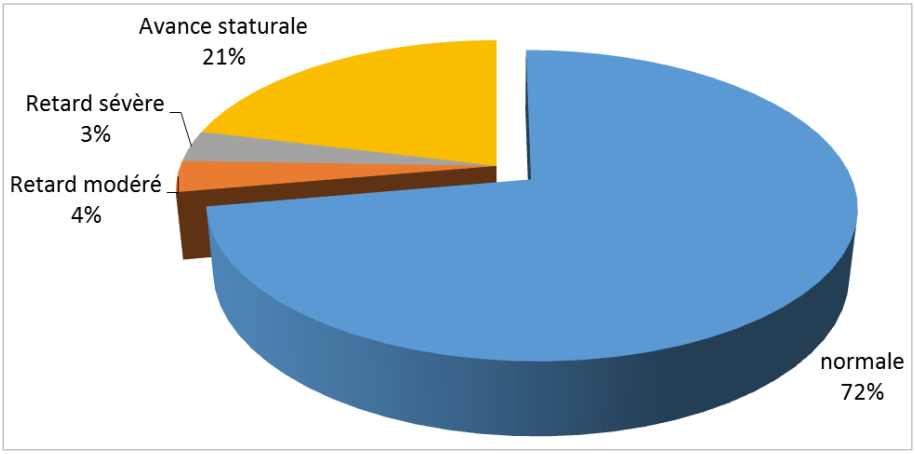


***Figure 3.*** *Height growth of patients with Graves' disease.*

Biologically, hyperthyroidism was confirmed by low TSH levels in 97.67% of cases, elevated T4 levels in 90%, and elevated T3 in 84.61%. TSH receptor antibodies (TRAb) were positive in most patients (96.3%). Neonatal hyperthyroidism had a prevalence of 4%. All patients had a maternal history of Graves' disease. The most frequent clinical sign was tachycardia (50%). Under synthetic antithyroid treatment, 60% of patients went into remission within six months. Congenital hypothyroidism represented 5.6% of thyroid dysfunctions. The average age at diagnosis was 1.82 years, with a mean consultation delay of 7.68 months. Three-quarters (75%) of the patients presented with psychomotor developmental delay. Umbilical hernia was the most frequent sign (57.14%), followed by hypertelorism (28.57%). Biologically, all patients had elevated TSH with predominantly low T4 levels. Cervical ultrasound showed a normally developed thyroid gland in its normal position in all cases. Levothyroxine was used at an average dose of 6.9 µg/kg/day. Persistent hypothyroidism was observed in 80% of cases. Hashimoto's thyroiditis had a prevalence of 4%. The average age at diagnosis was 9.8 years, and no patient had a family history of thyroid dysfunction. Goiter was the only clinical sign observed (80%). Elevated TSH and low T4 levels (in 80% of patients) confirmed the diagnosis. Levothyroxine was administered at an average dose of 4.38 µg/kg/day. Thyroid nodules had a prevalence of 4%. No patient had a family history of thyroid dysfunction. Goiter was present in 40% of cases and was the only clinical sign. All patients were biochemically euthyroid at diagnosis. Cervical ultrasound revealed variable aspects: two-thirds of patients were classified as EU-TIRADS 3, and one-third as EU-TIRADS 2. Only one fine-needle aspiration was performed, which revealed benign features. A conservative approach was adopted for all patients, and no long-term outcomes were reported. We recorded one case of subacute thyroiditis.

## 4. Discussion

In our study, thyroid dysfunctions represented 62.8% of all endocrine disorders (excluding diabetes). This high prevalence could be explained by the fact that our population consisted exclusively of pediatric patients.

We noted a female predominance, which is consistent with the findings of Mariko M et al. [6], who reported 81% of cases in girls, confirming that autoimmunity tends to occur more frequently in females.

A family history of thyroid disease was found in 24.4% of our patients. This aligns with literature data [7], supporting the idea of a genetic predisposition to thyroid pathology.

At the time of diagnosis, 86.29% of patients had hyperthyroidism and 10% had hypothyroidism. This predominance of hyperthyroidism in patients under 18 is comparable to findings by Mariko M et al. [6], who reported 77.8% hyperthyroidism and 22.2% hypothyroidism.

Graves' disease was the leading cause of thyroid dysfunction in our study, accounting for 81.6% of cases. This rate differs from most European literature [8], where Graves' disease is considered rare in children. The average age of our patients was 9.18 years, like data found in other studies [9].

The female predominance (67.6%) in our study is consistent with findings by Boiko et al. [9], who reported proportions of 76.5% and 76%. Goiter was present in 89.1% of cases, consistent with findings throughout the literature [9, 10].

Puberty was normal in 93.1% of patients, while 6.9% had delayed puberty. These findings differ from some studies [11], where up to one-third of patients had pubertal delay. Puberty remains an important parameter to assess in any child with a chronic illness.

Neonatal hyperthyroidism had a prevalence of 4% in our study, which is higher than the 0.8% reported by Boiro et al. [9], underscoring the rarity of this condition, as described in the literature [12, 13].

All patients with neonatal hyperthyroidism had a maternal history of Graves' disease, consistent with literature reports indicating that neonatal hyperthyroidism most often occurs in the context of maternal Graves' disease [12-14]. Therefore, appropriate monitoring is essential in all newborns of mothers with Graves' disease.

In our cohort, 60% of patients achieved remission under synthetic antithyroid drugs, while 40% had persistent disease. These results are consistent with existing literature [12, 13], confirming the often-transient nature of neonatal hyperthyroidism.

Congenital hypothyroidism had a prevalence of 5.6% in our study. In a study conducted in Dakar and published in 2016, Niang et al. [15] found a prevalence of 25.2% of all endocrine disorders. This difference may be explained by the longer study duration (14 years vs. 4 years in ours).

The lower prevalence in our setting compared to developed countries is likely due to the lack of routine neonatal screening. Girls were more affected, with a sex ratio of 0.6, like that found by Niang et al. [15] (sex ratio 0.47).

The average age at diagnosis was 21.84 months, suggesting some improvement in early diagnosis compared to Niang et al. [15], where the average age was 54.26 months. Psychomotor delay was very common (80%), although slightly lower than the 92.85% reported by Niang et al. [15].

These findings align with literature [16, 17] that identifies congenital hypothyroidism as the leading preventable cause of intellectual disability. Early diagnosis is therefore crucial. In our context, it is essential to make neonatal screening tests available to minimize the neurodevelopmental impact of delayed diagnosis.

The prevalence of Hashimoto's thyroiditis was 4%, lower than the 10% reported by Mariko M et al. [6]. The predominance in females (sex ratio 0.25) is well supported by the literature [18, 19].

In our study, the average age at diagnosis was 9.8 years, like the findings of Marinovic et al. [20] and Bouferoua et al. [18], who reported averages of 11.9 years and 8.75 years respectively. These results confirm the frequency peak of this condition during puberty [15]. Thus, in any case of acquired hypothyroidism in older children, Hashimoto's thyroiditis should be systematically considered.

Thyroid nodules had a prevalence of 4% in our population. In a 20-year study conducted in Tunis, Nefzaoui et al. [21] reported a prevalence of 0.7% among patients followed for thyroid dysfunction. This supports the rarity of thyroid nodules in the pediatric population, as also shown in the literature [22].

In our study, the sex ratio was 0.25, compared to 0.07 in the study by Nefzaoui et al. [21], confirming the higher prevalence among girls.

Subacute thyroiditis had a prevalence of 0.8% in our series. This supports literature reports [23], which describe subacute thyroiditis as a rare inflammatory thyroid condition, especially in children.

## 5. Conclusion

Thyroid disorders are the most common endocrine diseases in our practice setting. They are mainly represented by Graves' disease and neonatal hypothyroidism. From screening to treatment, their management remains challenging in a resource-limited country where pediatric endocrinology is still an emerging specialty.

## Abbreviations

| | |
|---|---|
| TSH | Thyroid-Stimulating Hormone |
| TRAB | TSH Receptor Antibodies |
| T4 | Serum Tetraidothyronine |
| T3 | Serum Triiodothyronine |

## Author Contributions

**Aminata Mbaye:** Conceptualization, Investigation, Data curation, Writing – original draft

**Ndeye Fatou Sow:** Visualization

**Awa Kane:** Investigation

**Guillaye Diagne:** Methodology
**Amadou Sow:** Writing – original draft
**Djibril Boiro:** Conceptualization, Supervision, Validation

## Conflicts of Interest

The author states no conflict of interest.

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