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ORIGINAL RESEARCH

Spectrum of Paediatric Thyroid Disorders at the Lagos State University Teaching Hospital, Lagos, Nigeria

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Abstract

Background: Thyroid disorders contribute significantly to paediatric endocrine referrals. This is unsurprising, as adequate thyroid function is important for children's optimal physical and neurocognitive development. Identifying the spectrum of thyroid disorders and the most common ones is important for planning and defining health policies.

Objectives: To describe the spectrum and clinical features of paediatric thyroid disorders at the Lagos State University Teaching Hospital.

Methods: A retrospective review of medical records of children aged 0 to 17 years referred for thyroid disorders between March 2017 and October 2023 was carried out. Information extracted from the records included age, gender, weight, height, diagnosis, and clinical features for analysis.

Results: A total of 44,324 and 505 (15%) children were seen at the Paediatric Outpatient and Endocrinology Clinics, respectively, during the study period. Seventy-six (15.0%) of the 505 children were diagnosed with thyroid disorders. The male-to-female ratio was 0.8:1, and 22 (28.9%) of the children evaluated were infants. Congenital hypothyroidism and Graves' disease were recorded in 28 (36.8%) and 15 (19.7%) of the cases, respectively. Eleven (39.3%) of the children with congenital hypothyroidism had features of Down syndrome.

Conclusion: The incidence of thyroid disorders in the paediatric general outpatient clinic was 1.7 per 1000 new cases, and 15% of paediatric endocrine cases had thyroid disorders. Thyroid disorders were twice as likely to affect females, and one-third of our patients were referred to the clinic before their first birthday. Congenital hypothyroidism and Graves' disease were the leading types of thyroid disorders recorded.

Keywords: Congenital hypothyroidism, Down syndrome, Endocrine disorders, Graves' disease, Thyroid gland.

Introduction

The thyroid gland is the hormone-secreting organ that regulates body metabolism, including

neurocognition, growth, and development. [1] Dysregulation and altered production of thyroid hormones, namely triiodothyronine and thyroxine, cause several disorders ranging from goitre to life-threatening diseases. [2] Thyroid disorders occur when abnormal thyroid function leads to either deficient or excessive production of thyroid hormones. [2] This dysfunction may be caused by multiple factors, including nutritional, genetic, autoimmune, and environmental factors. [2 - 4] Suboptimal thyroid functions in foetal and early post-natal life may result in neurocognitive dysfunction, irreversible brain damage, and poor motor development. [5] Thyroid disorders may present shortly after birth or later in childhood and may contribute significantly to disease burden in children and adolescents. [4] Thyroid dysfunction is a major reason for paediatric endocrine referrals, and this is reflected in its status as the second most common endocrine disorder after diabetes mellitus in children worldwide.[6]

The prevalence of thyroid disorders in children varies considerably across countries. Globally, about 300 million people are reported to be living with thyroid disorders, [7] with over 25% of this global burden in Africa. [8] Estimates from paediatric endocrinology clinics in Nigeria showed that the burden of thyroid disorders constituted 6.4% to 37% of all endocrine disorders. [9-13] Thyroid disorders may manifest as hypothyroidism, hyperthyroidism, thyroid nodules, malignancies, and endemic goitre in iodine-deficient regions. Hypothyroidism accounts for 90% to 95% of all cases of thyroid gland disorders, which can be due to congenital or acquired causes.[14] Graves' disease is the most common cause of hyperthyroidism.[15]

The present study aimed to determine the spectrum and clinical features of paediatric thyroid disorders at the Lagos State University Teaching Hospital (LASUTH), Ikeja, Lagos, Nigeria, over six years.

Methods

This retrospective study was carried out using the hospital records of children and adolescents who presented to the LASUTH Paediatric Endocrinology Clinic. A paediatric endocrinologist supervised clinic activities while paediatric resident doctors rotated through the clinic. Nurses assisted with the measurement of vital signs, height, and weight. Laboratory requests were processed at the hospital's laboratory and other laboratories with international collaborations when facilities for tests were unavailable at the hospital laboratory.

The medical records of children aged 0 to 17 years who were referred to the clinic for evaluation for thyroid disorders between March 2017 and October 2023 were accessed. Information such as age, gender, weight, height, clinical features, diagnosis, treatment, parental age, level of education, and occupation were extracted from the medical records.

The diagnosis of thyroid disorders was made from history, clinical findings (goitre and other related signs), and laboratory and radiological findings. Hypothyroidism was defined as high TSH with low free T₄ (fT₄). Hyperthyroidism was characterised by low TSH and high fT₄ with or without high fT₃, while Graves' disease was diagnosed with positive thyrotropin receptor antibodies (TRAb). [16] Hashimoto's thyroiditis was defined by high thyroid-stimulating hormone (TSH) and low fT₄ associated with high antithyroid peroxidase (TPO) and/or antithyroglobulin (TG) antibodies. [16] A diagnosis of subclinical hypothyroidism was made if there was a combination of high TSH and normal fT₄ levels. A radiologist did a thyroid ultrasonographic scan for cases of goitre. Thyroid disorders were categorised as congenital hypothyroidism, acquired hypothyroidism including Hashimoto's thyroiditis,

hyperthyroidism including Graves' disease, toxic nodular goitre, and simple non-toxic goitre.

Data was analysed with the Statistical Package for the Social Sciences, version 26.0, Chicago, USA. The patients' demographic profiles were represented as frequencies and percentages, and tables and images represented variables as appropriate.

Ethical considerations

Ethics approval for the study was obtained from the Ethics and Research Committee of the LASUTH, Ikeja, Lagos, Nigeria (LREC/06/10/1769).

Results

A total of 505 children with endocrine disorders were retrieved out of the 44,324 new cases who presented at the outpatient clinic (prevalence of 1.1%). Seventy-six of these children had thyroid disorders, thus constituting 0.17% of all cases (incidence 1.7 per 1000 new cases) and 15.0% of paediatric endocrine disorders.

Forty-three (56.5%) of the patients were female, and the male-to-female ratio was 0.8:1. One-third (20, 33%) of the patients had a family history of thyroid disorder. The majority (32, 42.1%) of the patients presented between the ages of six and ten years, 4 (5.2%) presented between two and five years, and four (18.5%) presented between 11 years and 17 years. The mean age at diagnosis was 5.9 ± 4.9 years, with 22 (28.9%) of these being infants. Four patients were obese by the Body Mass Index category (Table II).

Congenital hypothyroidism and Graves' disease constituted 28 (36.8%) and 15 (19.7%) of the cases, respectively (Table III). Ten (13%) of the patients

belonged to mothers with hyperthyroidism. Other diagnoses were Hashimoto thyroiditis and simple non-toxic goitre.

Five infants born to hypothyroid mothers were referred to the clinic to be reviewed. All five had normal thyroid function test results during clinic follow-up. Four patients who were referred to the clinic to be evaluated for thyroid disorders had a final diagnosis of thyroglossal cyst. Two patients were diagnosed with toxic nodular goitre. Eleven (39.3%) of the patients with congenital hypothyroidism had features of Down syndrome. One of the patients with Graves' disease presented with heart failure.

As shown in Figure 1, the predominant clinical manifestations of thyroid disorders were goitre (27.6%), weight loss (18.4%), exophthalmos (18.4%), diaphoresis (13.1%), and palpitation (13.1%).

Discussion

The incidence of thyroid diseases in this study was 1.7 per 1000 with a rate of 0.17%, which aligns with other studies reporting rates of between 0.10% and 0.14%.^[10-13] This figure is approximately 25 times higher than a report from the same country four decades ago.^[9] This significant increase could be attributed to advancements in paediatric thyroid research, leading to a better understanding and diagnosis of thyroid disorders in children. Furthermore, the growing number of paediatric endocrinologists and enhanced training opportunities in Nigeria have increased awareness and disease detection. Nonetheless, the incidence remains considerably lower than rates reported in developed countries,^[17] possibly due to a high rate of undiagnosed thyroid disorders.

Table I - Demographic and clinical characteristics of patients

	Category	Frequency (n=76)	Percentage
Gender	Female	43	56.6
	Male	33	43.4
Age at diagnosis	0 -1	26	34.2
	2-5	4	5.2
	6 –10	32	42.1
	11-17	14	18.5
Family History	No	56	67
	Yes	20	33
Height Percentile	0 –4	12	15.7
	5 –84	53	69.7
	85 –94	2	2.8
	95 –100	9	11.8
Weight Percentile	0 –4	12	15.7
	5 –84	59	78
	85-94	1	1.3
	95 –100	4	5
BMI percentile category	0 –4	12	15.7
	5 –84	57	75
	85 –94	3	3.9
	95 –100	4	5.2

Table II - Specific diagnosis and clinical conditions of patients

Diagnosis	Frequency	Percentage
Infant of hypothyroid mother	5	6.6
Unspecified hypothyroidism	1	1.3
Congenital Hypothyroidism	28	36.8
Graves' disease	15	19.7
Hashimoto thyroiditis	5	6.6
Infant of hyperthyroid mother (including one neonatal Graves' disease)	11	14.5
Simple non-toxic goitre	5	6.6
Thyroglossal duct cyst	4	5.3
Toxic nodular goitre	2	2.6
Total	76	100

Countries with established newborn screening programmes can more accurately identify and document thyroid conditions, unlike resource-limited settings such as Nigeria, where diagnoses may be missed, accounting for considerable differences in incidence rates.

Thyroid disorders represent a substantial proportion of paediatric endocrine cases, ^[4] accounting for 15% of the cases in the present study – a rate comparable to 13.4% reported in an earlier study from Lagos, Nigeria. ^[12] These

disorders were more commonly observed among females, consistent with previous findings in both paediatric and adult populations. ^[6,18] For instance, Edino *et al.* ^[19], in a retrospective review of 75 cases of thyroid gland disorders seen and managed at the Aminu Kano Teaching Hospital, Kano, over five years, found that 92% of 75 thyroid disorder cases at Aminu Kano Teaching Hospital were female. On the other hand, Jaja and Yarhere ^[13] reported a male predominance, with thyroid disorders being 1.7 times more common

in boys, although the reason for this discrepancy remains unclear.

The mean age at diagnosis of thyroid diseases in the present study was 5.9 years, which is similar to earlier reported ages of 5.4 and 6.1 years. [9,13] but notably younger than 11.2 years reported

elsewhere. [11] Congenital hypothyroidism emerged as the most common diagnosis in the present study, differing from trends in high-income countries where early diagnosis through newborn screening often precedes the onset of symptoms that require specialist referral. [19]

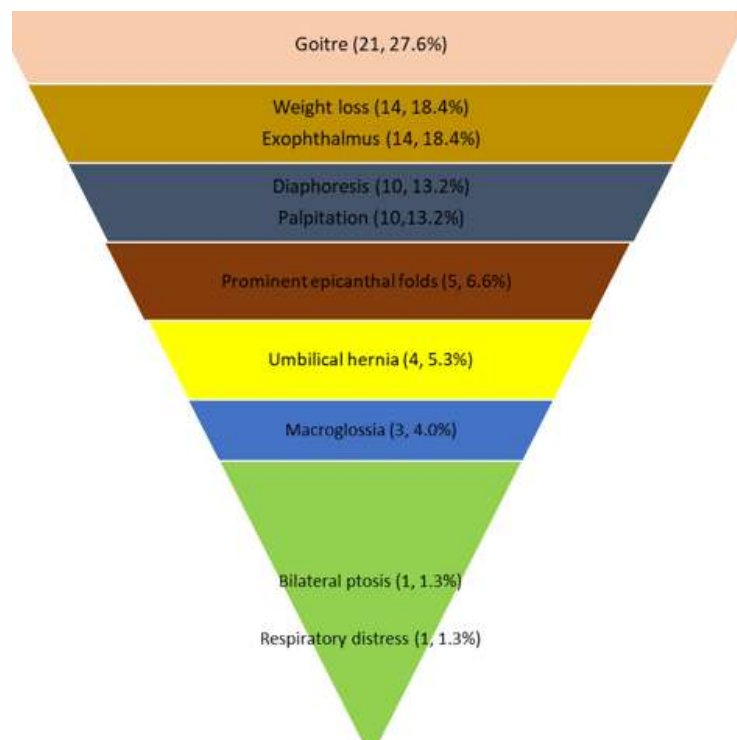


Figure I: Clinical presentations in patients with thyroid disorders

Congenital hypothyroidism accounted for 36.6%, a proportion consistent with earlier findings of 46.7% in Nigeria and 30.6% in India, [12,20] but lower than other Nigerian studies reporting 58.3% and 55%. [10,13] In the United States, the prevalence of congenital hypothyroidism rose from 9.5% in 2009 to 14.5% in 2019. [21] Globally, congenital hypothyroidism remains the most common paediatric thyroid disorder, [22] with rising incidence in part due to expanded newborn screening in wealthier countries. [21, 23] Early diagnosis is essential to initiate prompt treatment and prevent neurocognitive deficits and growth delays, as exemplified by a case in the present study where an eight-year-old child

presented with short stature and learning difficulties leading to poor school performance.

Thyroid disorders often coexist with other medical conditions. In the present study, 39.3% of the children with congenital hypothyroidism also had Down syndrome. Individuals with Down syndrome are at higher risk for various thyroid disorders, including autoimmune types, [24] with prevalence reported to be about 28 times higher than in the general population. [25] A retrospective review involving 147 children with Down syndrome revealed that up to 85% may have moderately elevated thyroid-stimulating hormone levels beyond the neonatal period. [26]

As such, the American Academy of Pediatrics recommends early consultation with paediatric endocrinologists and annual thyroid function screening for children with Down syndrome to facilitate early detection and treatment.^[27]

Graves' disease was the second most common disorder in the present study. It is the leading cause of hyperthyroidism in children, ^[28,29] and other studies have also reported its high prevalence. ^[11, 13] Clinical features of Graves' disease include a diffuse goitre along with signs and symptoms of hyperthyroidism. ^[30] Additionally, ophthalmopathy, commonly associated with Graves', is not often seen in other forms of hyperthyroidism. All children diagnosed with Graves' disease in the present cohort had diffuse goitre and associated symptoms. A child actually presented with heart failure.

Conclusion

This study highlights the prominent place of thyroid disorders in paediatric endocrinology, with congenital hypothyroidism and Graves' disease being the most commonly identified conditions. We strongly advocate for the implementation of nationwide newborn screening programs, similar to those in developed countries, to facilitate early diagnosis and intervention, thereby preserving neurocognitive development in children.

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