Original Article

Pediatric Thyroid Disorders in Two Teaching Hospitals in South-West Nigeria

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Abstract

Background: Normal thyroid function is essential for optimal physical growth and neurocognitive development in children. Thyroid disorder is the second most common cause of paediatric endocrine diseases. Undetected hypothyroidism in children is a major preventable cause of neurocognitive disability. Down syndrome patients constitute a significant proportion of congenital hypothyroidism. **Aims and Objectives:** The aim of this study was to describe and compare the pattern of pediatric thyroid disorders seen at EKSUTH and LTH. **Materials and Methods:** The index study is a descriptive study of all children managed for Pediatric thyroid disorders at EKSUTH and LTH over a 10 year period from March 2010 to March 2020. **Results:** Twenty four children presented with thyroid disorder accounting for 12.7% of the total 189 endocrine patients managed in both health facilities. The mean age at presentation was 4.9 years (age range: 3 months to 14 years). Majority, 13 (54.2%), were aged less than 5 years at presentation. M:F =1:1. Hypothyroidism was the most common thyroid disorder, accounting for 91.7% of all thyroid disorders, seen at the two Teaching Hospitals. Congenital hypothyroidism (58.3%) was the most common type of hypothyroidism and Down syndrome accounted for 57.1% of all the children with congenital hypothyroidism. Majority, 87.5%, of the patients were managed successfully with Levothyroxine while one patient with suspected malignant thyroid mass had thyroidectomy and was also given Levothyroxine. **Conclusion:** Congenital hypothyroidism is the most common pediatric thyroid disorder at EKSUTH and LTH.

Keywords: Down syndrome, hyperthyroidism, hypothyroidism, pediatrics, thyroid disorders

Introduction

Normal thyroid gland function is important in children. It helps in ensuring optimal growth and neurocognitive development in childhood.[1] Thyroid disorder is the second most common cause of pediatric endocrine diseases.[2] It is a spectrum of disorders characterized by hypo- or hyperfunctioning of the thyroid gland resulting in derangement of the circulating levels of tri-iodothyronine (T3), thyroxine (T4), and thyroid-stimulating hormone (TSH).[1] Thyroid disorder may be due to a primary thyroid problem or indirectly to a central disorder of the hypothalamic–pituitary function. Hypothyroidism is particularly deleterious if it is not detected and treated in the early infancy period leading to permanent derangement in the intellectual ability of a child; with time, skeletal maturation and growth are also affected.[3] Hence, the reason newborn screening for hypothyroidism is being advocated to ensure early diagnosis and treatment and avoid the complications associated with it.

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We present the review of thyroid disorders seen in the Pediatric Endocrinology Units of two state teaching hospitals (Ekiti State University Teaching Hospital [EKSUTH] and LAUTECH Teaching Hospital, [LTH] Osun State) in South-West Nigeria over a 10-year period.

The objective of this study was to describe and compare the pattern of childhood thyroid disorders as seen at the pediatric endocrinology clinics of EKSUTH and LTH over a 10-year period. All children aged <18 years with goiter and/or deranged thyroid function test were included in the study.

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Methods

The index study was a retrospective study of all children managed for pediatric thyroid disorders at EKSUTH and LTH over a 10-year period from March 2010 to March 2020. Bio data and essential clinical information about patients seen at the endocrinology clinics of both health facilities were entered into an Excel spreadsheet at presentation for effective follow-up of the patients. Relevant data were extracted, entered into, and analyzed using the IBM SPSS Statistics for Windows, version 22 (IBM Corporation, Armonk, New York, USA). Patients' ages were categorized into three groups (under 5 years, 5–10 years, and above 10 years), and the frequency of thyroid disorders in each age group was determined and charted. Diagnosis of thyroid disorders was made from history, clinical examination (goiter and other related signs), and laboratory and radiological findings. The main laboratory investigation at both health facilities, during the study period, was serum thyroid function test (TSH [reference range: 0.5–3.7 μIU/ml]), free T4 (fT4) (reference range: 0.8–2.0 ng/dl), and free T3 (reference range: 1.4–4.2 pg/ml). Hypothyroidism is defined as high TSH with low fT4, while hyperthyroidism is defined as low TSH with high freeT4. Patients who presented with goiter were further assessed with ultrasound machines by radiologists. Thyroid disorders were categorized as congenital hypothyroidism, acquired hypothyroidism, hyperthyroidism, malignant thyroid mass, and transient hypothyroidism in infants of thyrotoxic mothers; their frequencies were determined and charted. Thyroid disorders were also compared for both EKSUTH and LTH centers. The treatment of the patients was classified as levothyroxine (for hypothyroidism) and surgery with levothyroxine or antithyroid drugs (for hyperthyroidism). The outcome of thyroid disorders was classified as alive, dead, and lost to follow-up.

Ethical consideration

Ethical approval for the study was obtained from the Ethics and Research Committee of the EKSUTH, Ado Ekiti, Nigeria.

Results

There were 189 patients with endocrine problems seen in the two centers during the study period; 40 of these patients were seen at LTH, while 149 patients were seen at EKSUTH. Twenty-four children presented with a thyroid disorder accounting for 12.7% of the total endocrine patients from both centers. Of the 40 endocrine patients seen at LTH, 7 (18.9%) of them had thyroid disorders, while 17 (11.4%) of the 149 endocrine patients seen at EKSUTH had thyroid disorders.

The total number of children seen at the Pediatric Clinic of EKSUTH during the study period was 12,236, with 149 (1.22%) of these having various types of endocrine disorders and 17 (0.14%) having thyroid disorders, whereas, 9,520 new patients were seen at Pediatrics Clinic of LTH during the study period and 7 (0.074%) of these had thyroid disorders out of the total 40 (0.42%) children with endocrine disorders.

The mean age at presentation was 4.9 years with an age range of 3 months–14 years. A majority, 13 (54.2%) patients, were aged <5 years at presentation, while 7 (29.2%) were within 5–10 years age group, and the remaining 4 (16.7%) were older than 10 years. There were 12 males and 12 females giving a ratio of 1:1.

Overall, hypothyroidism was the most common thyroid disorder, accounting for 91.7% of all thyroid disorders seen among children at the two teaching hospitals in South-West Nigeria. Congenital hypothyroidism (58.3%) was the most common type of hypothyroidism, followed by acquired hypothyroidism (20.8%), as displayed in Table 1. Down syndrome patients accounted for 57.1% of all the children with congenital hypothyroidism. One (7.1%) of them had thyroid aplasia, while another one (7.1%) had panhypopituitarism. Children with acquired hypothyroidism predominantly presented within 5–10 years of age [Figure 1]. A greater proportion of acquired hypothyroidism was seen at EKSUTH, while the greater proportion of transient hypothyroidism (infants of thyrotoxic mothers on antithyroid drugs) was seen at LTH [Figure 2].

A majority, 21 (87.5%), of the patients were managed successfully with levothyroxine, while one (4.2%) with suspected malignant thyroid mass had thyroidectomy and was placed on levothyroxine. Most, 21 (87.5%), of the patients were alive and doing well on treatment, while 3 (12.5%) were lost to follow-up and none was reported dead during the study period.

Table 1: Frequency of thyroid disorders at Ekiti State University Teaching Hospital and LAUTECH Teaching Hospital

Description of thyroid disorder	Frequency (%)
Congenital hypothyroidism	14 (58.3)
Acquired hypothyroidism	5 (20.8)
Transient hypothyroidism (infants of thyrotoxic mothers on antithyroid drugs)	3 (12.5)
Hyperthyroidism	1 (4.2)
Malignant thyroid mass	1 (4.2)
Total	24 (100.0)

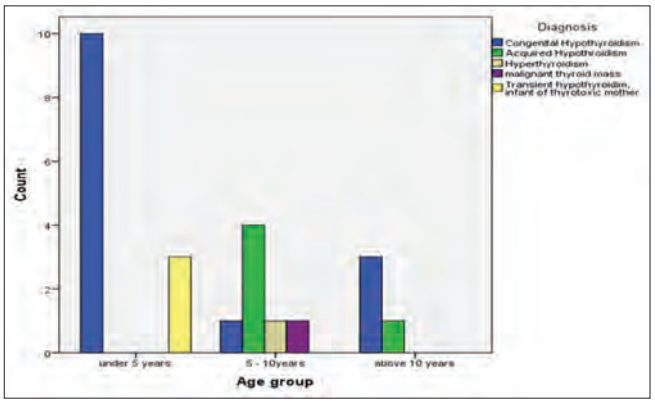

Figure 1: Pattern of thyroid disorders according to the age groups

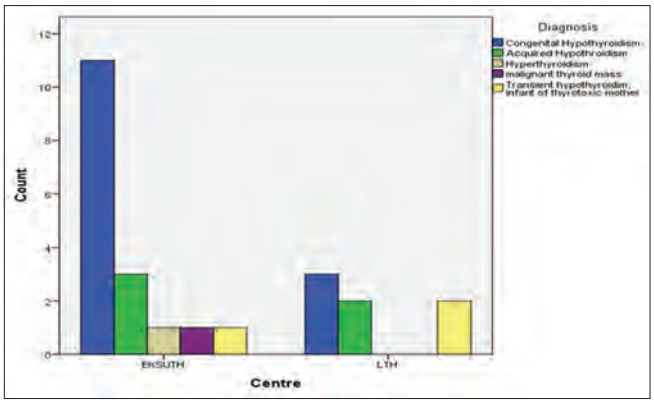

Figure 2: Comparison of the pattern of thyroid disorders seen at Ekiti State University Teaching Hospital and LAUTECH Teaching Hospital

Discussion

The proportion of thyroid disorders among all endocrine disorders recorded at both EKSUTH and LTH in the index study was 12.7% which is similar to 12.1% reported by Onyiriuka and Kouyate[4] in Benin, South–South Nigeria, and 13.4% reported by Oyenusi *et al*.[5] in Lagos, South-West Nigeria, but it was lower than 29.3% reported by Jaja and Yarhere[6] at Port Harcourt, South–South Nigeria. Moreover, the incidence of thyroid disorders among children seen at EKSUTH was 0.14% which is similar to 0.12% documented by Onyiruika *et al*.[8] at Benin (South–South Nigeria), 0.1% by Jaja and Yarhere[6] from Port Harcourt (South–South Nigeria), and Oyenusi *et al*.[5] from Lagos (South-West Nigeria). This incidence is however higher than 0.07% reported over 40 years ago by Laditan and Johnson[7] in Ibadan (South-West Nigeria). The higher incidence reported in recent studies from Nigeria compared to older studies could be explained by a greater number of pediatric endocrinologists maintaining the ever-increasing pediatric endocrinology clinics all over the nation through the effort of Paediatric Endocrinology Training Center for West Africa in collaboration with the European Society for Pediatric Endocrinology and International Society for Pediatric and Adolescent Diabetes which has been training pediatric endocrinologists for the West Africa subregion over the past 10 years. This in no doubt has increased the awareness about pediatric endocrinology disorders, thereby enhancing early presentation, diagnosis, and management.

The mean age for the presentation of pediatric thyroid disorders in the index study was 4.9 years; which is slightly lower than 5.4 years reported by Laditan and Johnson[7] in Ibadan; 6.1 years reported by Jaja and Yarhere[6] in Port Harcourt and 11.2 years reported by Onyiriuka *et al*.[8] in Benin. This can also be explained by greater awareness and increased screening for hypothyroidism in infants presenting with clinical features reminiscent of hypothyroidism such as poor weight gain, prolonged jaundice, floppiness, constipation, and poor suck, making them to be diagnosed and treated earlier.

Congenital hypothyroidism is the predominant form (58.3%) of thyroid disorder seen in the index study and affected children often present within the first 5 years of life. Many studies from Nigeria and other parts of the world also reported the predominance of hypothyroidism in children.[4-9] However, it has been documented that thyroid disorder in children can present at any age, and some authors have reported presentation during adolescence.[8,10,11]

The age at presentation in the index study ranged from 3 months to 14 years. Implementation of newborn screening at the study centers may improve the early detection. The youngest age at presentation in the study by Oyenusi *et al*.[5] was 7 hours, while other studies have reported age at presentation ranging from 5 days to 4 months.[6-8] These variations in the earliest age at presentation depends on the awareness of childhood thyroid disorders among health workers and the general population and availability of newborn screening program. It is very essential to reduce the earliest age at diagnosis of thyroid disorder in children to prevent the debilitating consequence of intellectual impairment, often accompanying late presentation. One of our patients presented at the age of 14 years with features of cretinism which cannot be reversed with levothyroxine therapy. This finding calls for increased sensitization of the health workers and the general populace about the presence of endocrine disorders in our environment and the need for a high index of suspicion to improve the age at diagnosis of these disorders.

The proportion of acquired hypothyroidism reported in the index study is higher at EKSUTH than at LTH; a possible explanation for this could be because EKSUTH is located in Ekiti State, a mountainous area with greater propensity for reduced iodine needed for thyroid hormone biosynthesis in the soil and food. Most affected patients also had a positive history of indiscriminate consumption of cough syrups given by their parents whenever they have a cough. High iodine/iodide content of certain cough expectorants has been documented to interfere with thyroid function.[12] Excess iodine inhibits essential steps in thyroid hormone biosynthesis from oxidation and organization of iodide to the secretion of T4 and T3 into the circulation resulting in clinical hypothyroidism.[13] The use of cough syrup should be discouraged in children, and mothers should be encouraged to see pediatricians for proper management of the health challenges of their children.

All the patients with acquired hypothyroidism in the index study presented with goiter and showed excellent response to hormone replacement therapy with levothyroxine. Goiter reduced significantly in size and none of them needed surgery.

The index study did not show any sex predilection for thyroid disorders in children, unlike previous studies where some documented higher occurrence in males[6] and others female preponderance.[5,8] The reason for these differences is unknown and may need further evaluation in a larger population study.

Down syndrome patients accounted for 57.1% of all the children with congenital hypothyroidism. This is comparable to 45% reported in Lagos, South-West Nigeria, by Oyenusi

et al.[5] It has been documented that persistent primary congenital hypothyroidism is 28 times more common in infants with Down syndrome than in the general population.[14] The frequency of hypothyroidism diagnosed in Down syndrome patients ranged from 7% to 23.5% in previous studies.[15-17] It is recommended by the American Academy of Pediatrics[18] that children with Down syndrome should have annual thyroid function evaluation. In line with evidence-based practices, infants with Down syndrome are routinely screened for thyroid dysfunction at EKSUTH and LTH; this may explain the higher incidence of congenital hypothyroidism in this study compared to some earlier studies from Nigeria which did not report hypothyroidism among Down syndrome patients.[6-8] All Down syndrome patients in all health facilities should be offered the added advantage of routine screening and management for hypothyroidism and prompt referral to pediatric endocrinologists. Furthermore, there is a need for more advocacies to the government and policymakers on health issues to ensure routine newborn screening for congenital hypothyroidism in all developing countries to stem the tide of preventable brain damage caused by missed/undiagnosed congenital hypothyroidism.

One patient had hyperthyroidism in the index study accounting for 4.2% of all thyroid disorders seen during the study period; this was slightly higher than 2% reported from India by Desai[19] but lower than a range of 12.7%–66.7% documented in previous Nigerian studies.[5-8] The affected patient is a female which agrees with findings from previous studies that hyperthyroidism more commonly affects female adolescents.[3,5-8,11] Moreover, the small proportion (4.2%) of females in the adolescent age group in the index study population may also partly explain the low representation of hyperthyroidism in this study since hyperthyroidism is more common among female adolescents.

The patient who had thyroidectomy presented with nodular thyroid mass suspected to be malignant which was successfully operated, and the patient is doing very well on levothyroxine (histology report was not yet available at the time of this report).

Infants of thyrotoxic mothers accounted for 12.5% of all thyroid disorders managed in the index study. This is similar to 12.7% reported by Oyenusi *et al*.[5] Transient neonatal hypothyroidism may develop in neonates delivered to mothers on antithyroid drugs or when TSH receptor-blocking antibodies from the mother cross the placenta to the fetus.[11] Transient neonatal hypothyroidism usually resolves within 3–4 months. All affected babies in the index study recovered fully and became euthyroid after few months on L-thyroxine replacement therapy.

Conclusion

Congenital hypothyroidism is the most common pediatric thyroid disorder and a major cause of preventable mental retardation. Children with Down syndrome contribute significantly to the proportion of children with hypothyroidism. Down syndrome patients should be routinely screened and treated for thyroid dysfunction. Routine neonatal screening for congenital hypothyroidism should be made mandatory in developing countries.

Limitation of the study

Being a retrospective study, it is possible some data were lost for analysis and reporting during the study period.

The small sample size of patients with thyroid disorder at both heath facilities may also limit the broader application of the findings of the study.

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Nil.

Conflicts of interest

There are no conflicts of interest.

References

1. Hanley P, Lord K, Bauer AJ. Thyroid Disorders in Children and Adolescents: A Review. JAMA Pediatr 2016;170:1008-19.
2. Becker KL, Nylen ES, Snider RH. Endocrinology and the endocrine patient. In: Becker L, Ronald CK, Rebar RW, editors. Principles and Practice of Endocrinology and Metabolism. 3rd ed.. Philadelphia: Lippincott, Williams and Wilkins; 2002. p. 82-5.
3. Brown RS, Huang S. The thyroid and its disorders. In: Brooks CG, Clayton PE, Brown RS, editors. Brooks Paediatric Endocrinology. 5th ed.. Massachusetts: Blackwell Publishing; 2005. p. 218-53.
4. Onyiriuka AN, Kouyate M. Paediatric endocrine disorders as seen at the University of Benin teaching hospital over a ten-year period. Nijer J Paediatr 2014;41:316-20.
5. Oyenusi EE, Ajayi EO, Akeredolu FD, Oduwole AO. Pattern of thyroid disorders in children and adolescents seen at the Lagos university teaching hospital, Nigeria, Over a 10-year Period. Niger Med J 2017;58:101-6.
6. Jaja T, Yarhere IE. Clinical characteristics of children and adolescents with thyroid disorders seen at the University of Port Harcourt Teaching Hospital: A five year review. Niger J Paed 2014;41:302-6.
7. Laditan AA, Johnson AO. Thyroid gland disorders in African children. J Natl Med Assoc 1979;71:139-41.
8. Onyiriuka AN, Abiodun PO, Onyiriuka LC. Thyroid disorders in childhood and adolescence: Analysis of clinical data and management challenges in patients seen in a Nigerian Teaching Hospital. Greener J Med Sci 2012;2:045-0.
9. Singh A, Purani C, Mandal A, Mehariya KM, Das RR. Prevalence of thyroid disorders in children at a tertiary care hospital in Western India. J Clin Diagn Res 2016;10:SC01-4.
10. Ogbera AO, Kuku SF. Epidermiology of thyroid disease in Africa. India J Endocrinol 2011;5:82-8.
11. Brown RS. Disorder of Thyroid Gland in Infancy, Childhood and Adolescence. Available from: http://www.thyroidmanager.org. [Last accessed on 2020 Apr 25].
12. Sugumar R, Kannan S, Asirvatham AR, Mahadevan S. Absence of Iodine/Iodide in Cough/Expectorant Medications: A True Disclaimer or not? Indian J Nucl Med 2018;33:84-5.
13. Bahn RS, Burch HB, Cooper DS, Garber JR, Greenlee MC, Klein I, ***et al***. Hyperthyroidism and other causes of thyrotoxicosis: Management guidelines of the American Thyroid Association and American Association of Clinical Endocrinologists. Endocr Pract 2011;17:456-520.
14. Fort P, Lifshitz F, Bellisario R, Davis J, Lanes R, Pugliese M, ***et al***. Abnormalities of thyroid function in infants with Down syndrome. J Pediatr 1984;104:545-9.
15. Purdy IB, Singh N, Brown WL, Vangala S, Devaskar UP. Revisiting early hypothyroidism screening in infants with Down syndrome.

J Perinatol 2014;34:936-40.
16. Moosa S, Segal DG, Christianson AL, Gregersen NE. Thyroid dysfunction in a cohort of South African children with Down syndrome. S Afr Med J 2013;103:966-70.
17. Iugheti L, Predieri B, Bruzzi P, Predieri F, Vellani G, Madeo SF, *et al*. Ten-year longitudinal study of thyroid function in children with Down syndrome. Horm Res Paediatr 2014;82:113-21.
18. American Academy of Pediatrics. Committee on genetics. American Academy of Pediatrics: Health supervision for children with Down syndrome. Pediatrics 2001;107:442-9.
19. Desai MP. Disorders of thyroid gland in India. Indian J Pediatr 1997;64:11-20.