DOI: https://doi.org/10.53350/pjmhs020231712127

ORIGINAL ARTICLE

Prevalence of Thyroid Disorders in Children at a Tertiary Care Hospital

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ABSTRACT

Background: Thyroid disorders are most common in children. Early diagnosis and management is crucial.
Objective: The aim of this study was to find out the Prevalence of Thyroid Disorders in Children at a Tertiary Care Hospital.
Materials and Method: The current retrospective study was carried out at the pediatric department of HBS General Hospital, Islamabad from July 2022 to June 2023, after taking approval from the ethical board of the institute. Children below 5 year old with thyroid dysfunction symptoms who visited the OPD and IPD of the hospital were included. A total 502 individuals were enrolled their demographic features were noted. The thyroid gland was examined in accordance with WHO recommendations. The thyroid profiles of all the participants were diagnosed, including the levels of, T4 and T3. The tests were used in this study were T3-ARCHITECT Total T3 assay (Abbott Diagnostics, reagent B7K640), TSH-ARCHITECT TSH assay (Abbott Diagnostics, reagent B7K620) & T4-ARCHITECT Total T4 assay (Abbott Diagnostics, reagent B7K660). Furthermore, children with hypothyroidism underwent testing and anemia grading using estimations of hemoglobin and RBC indices. When hypothyroidism manifested as a single thyroid nodule, FNAC of the thyroid gland was carried out. Data was entered to Microsoft excel and represented in frequency and percentage.
Results: A total of 502 children below 12 years old were screened for thyroid disorders .out of which 69 (13.7%) were found to have thyroid dysfunction. the prevalence of hypothyroidism was observed in 63(91.3%) and 6(8.6%) had hyperthyroidism. Goiter was present in only 16% of individuals with thyroid dysfunction**.** Dwarfism was the most prevalent clinical manifestation (60%) and was followed by lethargy (50.7%) were noted in hypothyroid individuals. All the individuals with hyperthyroidism showed tachycardia while palpitation and heat intolerance were observed in 83. Anemia was observed in 20 (31.74%) of the hypothyroid children. There was no instance of thyroid gland cancer. Congenital heart disease was the most prevalent of the several co-morbidities found in 24 children with thyroid dysfunction.
Conclusion: Our study concluded that the thyroid disorders are most prevalent in children (13.7%), and further studies of this kind from other parts of the country with larger populations are really needed
Keywords: Thyroid disorders; Children; Prevalence.

INTRODUCTION

Thyroid is one of the endocrine gland that present below the larynx. It is larger in weight in adults as compared to neonates however its weight increase with age. It produce two very important hormones which include T3 (Triiodothyronine) and T4 (thyroxin) which play very important role in metabolism and growth of the body. T3 is four times more potent than T4 and only shortly available in the bloodstream in small quantities. T4 is the main hormone produce by this gland and is less potent from T3 and has a longer half-life but physiologically it is less active.[1] The three types of thyroid disorders are Primary thyroid dysfunction, secondary pituitary gland dysfunction, and tertiary hypothalamic diseases. Thyroid gland disorder can also be accrued due to insufficient supply of iodine. Growth in Children is mainly effected due to the disorder in the thyroid gland. These disorders may be hypothyroidism or hyperthyroidism.[2] Children with hypothyroidism grow very slowly, while children with hyperthyroidism grow taller at a young age due to their skeletal bones' excessive growth rate. These children's adult growth periods are ideally shortened because their bones are mature and near epiphyses at a young age. The thyroid gland also plays a role in the brain's growth and development both before and after the foetus is born, as well as in the first few years following birth.[3] Thyroid hormones must be secreted in sufficient amounts for the brain to grow and mature both before and after birth. If these hormones are not secreted in sufficient amounts, the brain grows and matures very slowly and shrinks in size relative to its normal size. Sometimes a child's thyroid gland is completely missing, leaving them mentally ill for the rest of their lives.[3] When the thyroid gland is overstimulated, too many thyroid hormones are produced, a condition known as hyperthyroidism. The causes of hyperthyroidism include thyroid adenoma, exophthalmos, Grave's disease, toxic goitre, and thyrotoxicosis.[4] It became clear that children's hyperthyroidism symptoms often appeared between the ages of 3- 16 years.[5] Low thyroid hormone synthesis as a result of the thyroid gland receiving inadequate iodine is known as hypothyroidism. Children are more likely to have it.[6] Facial swelling and circles under the eyes are symptoms of myxedema and cretinism, which is caused by lack of thyroid hormone.[8] therefor this study was carried out to find out the Prevalence of Thyroid Disorders in Children at a Tertiary Care Hospital.

Received on 11-07-2023
Accepted on 19-11-2023

MATERIALS AND METHOD

The current study was carried out at the pediatric department of HBS General Hospital, Islamabad from July 2022 to June 2023, after taking approval from the ethical board of the institute. Children below 5 year old with thyroid dysfunction symptoms who visited the OPD and IPD of the hospital were included. Individuals who were taking medicines for altering the status of hormone, had already been diagnosed with a thyroid disorder and were receiving treatment were excluded. A total 502 individuals were enrolled, 200 from in-patient department and 302 from Out-Patient Department. Written consent was taken from the parent of each participant. Demographic features including, sex, age, family history related to hormones, usage of iodine containing salt and symptoms associated with thyroid hyper- or hypo-function, like constipation, persistent neonatal jaundice, lethargy, dry skin, and developmental delay were noted. Measurements of anthropometry were recorded and matched with those provided by the CDC references. Medical conditions were noted, and a thorough systematic examination was conducted. The thyroid gland was examined in accordance with WHO recommendations. We also searched for eye symptoms of hyperthyroidism, such as conjunctival chemosis, lid retraction, exophthalmos, lid lag, external opthalmoplegia, etc. The thyroid profiles of all the

participants were diagnosed, including the levels of TSH, T4 and T3. 3 milliliter blood sample has been collected in a simple vial under aseptic conditions at the lab of the hospital and after clotting it was centrifuged for 30 minutes at 2000 revolution /minute for the separation of blood serum. The separated serum was labeled and kept at -20^{o}C in the refrigerator for further analysis. The tests were used in this study were T3-ARCHITECT Total T3 assay (Abbott Diagnostics, reagent B7K640), TSH-ARCHITECT TSH assay (Abbott Diagnostics, reagent B7K620) & T4-ARCHITECT Total T4 assay (Abbott Diagnostics, reagent B7K660). The conventional T3, T4, and TSH cutoffs for various age groups were used to characterize thyroid dysfunction (hypothyroidism or hyperthyroidism). Furthermore, children with hypothyroidism underwent testing and anemia grading using estimations of hemoglobin and RBC indices. A thyroid scan was carried out. When hypothyroidism manifested as a single thyroid nodule, FNAC of the thyroid gland was carried out. Data was entered to Microsoft excel and represented in frequency and percentage.

RESULTS

A total of 502 children below 12 years old were screened for thyroid disorders .out of which 69 (13.7%) were found to have thyroid dysfunction. the prevalence of hypothyroidism was observed in 63(91.3%) and 6(8.6%) had hyperthyroidism. The majority of individuals with thyroid hormone abnormalities were in the 0–1 age group, followed by the 9–12 age group. Although the overall male to female ratio was 1:1.2, the ratio in the 9–12 age group was 1:2.5, and a progressive increase in the female prevalence of cases was noted as participant age increased. Goiter was present in only 16% of individuals with thyroid dysfunction but it was associated to 50% of cases of hyperthyroidism and (14.2%) in hypothyroidism presented in **figure1.** Children with hypothyroidism were found to use iodized salt at a low rate (70%) but all children with hyperthyroidism were iodized salt users. No one of the hyperthyroid individuals had a positive family history, whereas 5 out of 63 hypothyroid individuals (8%) had a family association with thyroid issues. Among patients with hypothyroidism, dwarfism was the most prevalent clinical manifestation (60%) and was followed by lethargy (50.7%).The majors features of hypothyroidism is presented in **table 1.**

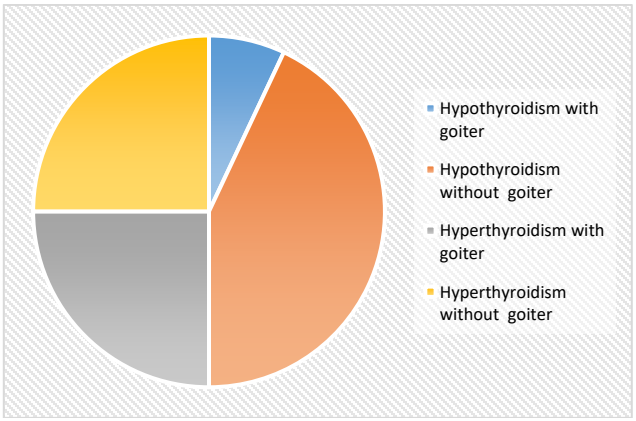

Figure 1: Prevalence of goiter in children with thyriod dysfunction

All the individuals with hyperthyroidism showed tachycardia while palpitation and heat intolerance were observed in 83% individuals as presented in table 2. 12 cases of neonatal hypothyroidism and 2 episode of transitory neonatal hyperthyroidism were reported. The bone age of children with hyperthyroidism was normal, but 30% of children with hypothyroidism had delayed bone age. Anemia was checked for in hypothyroidism individuals. Anemia was observed in 20 (31.74%) of the hypothyroid children. Microcytic, hypochromic RBCs were seen in all anemic individuals, and 46 (73.4%) hypothyroid youngsters had indications of iron deficiency. 36 individuals with hypothyroidism underwent thyroid scintigraphy; the most frequent finding was dyshormonogenesis (47%), which was followed by normal radiotracer uptake 41%.(figure.2) 4 individuals each had lymphocytic thyroiditis and chronic granulomatous thyroiditis, and two patients had benign follicular thyroid disease out of the 10 hypothyroid patients who underwent FNAC of the thyroid gland. There was no instance of thyroid gland cancer. Congenital heart disease was the most prevalent of the several co-morbidities found in 24 children with thyroid dysfunction. Table 3 illustrate the co-morbidities in children with thyroid dysfunction.

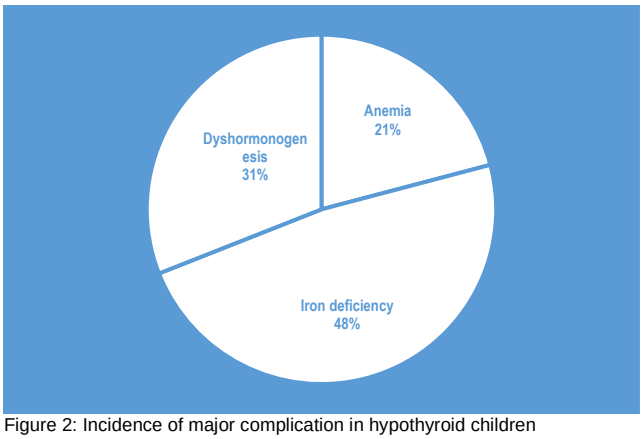

Figure 2: Incidence of major complication in hypothyroid children

Table 1:Clinical characteristics of individuals with hypothyriodisms n=63

Features	N (%)
Dwarfism	38 (60%)
Constipation	32 (50.7%)
Lethargy	27 (42.8%)
Non pitting edema	27 (42.8%)
Dry skin	26 (41%)
Developmental delay	25 (39.6%)
Slow relaxation of deep tendon reflexes	25 (39.6%)
Pallor	22 (34.9%)
Coarse facies	20 (31.7%)
Delayed closure of anterior fontanel	15 (23.8%)
Change in voice/ dysphagia	14(22.2%)
Prefers heat	14 (22.2%)
Umbilical hernia	12 (19.0%)
Prolonged neonatal jaundice	10 (15. %)
Bradycardia	10 (15.8%)
Positive History of family	5(7.9%)
Goiter	9 (14.2%)

Table 2: Clinical characteristics of individuals with hyperthyroidism n=6

Features	N (%)
Tachycardia	6 (100%)
Palpitation	5 (83%)
Heat intolerance	5(83%)
Hyperactivity	3 (50%)
Weight loss	3(50%)
Increased frequency of stools	3 (50%)
Moist skin	3(50%)
Polyuria	3 (50%)
Positive family history	3 (50%)
Goiter	3 (50%)
Fatigue	2 (33.3%)
Tremor	2 (33.3%)
Ophthalmopathy	2(33.3%)

Table 3: Co-morbidities in children with thyroid dysfunction.

Co-morbidities	N
Congenital heart disease	6
Thalassemia	5
Cerebral palsy	5
Down's syndrome	3
Diabetes mellitus	2
Hypopituitarism	2
Hypoparathyroidism	2
Extrahepatic portal venous hypertension	2
Hypophosphatemic rickets	2
Constrictive pericarditis	2
Asplenia syndrome	2

DISCUSSION

In the current study total of 502 children below 12 years old were screened for thyroid disorders .out of which 69 (13.7%) were found to have thyroid dysfunction. The prevalence of hypothyroidism was observed in 63(91.3%) and 6(8.6%) had hyperthyroidism. Females of all ages are known to have a higher prevalence of thyroid disorders.[7.] In the current study male to female ratio was 1:1.2, the ratio in the 9–12 age group was 1:2.5, and a progressive increase in the female prevalence of cases was noted as participant age increased. Another study from Scotland found a male to female ratio of 1:2.8 in patients under the age of 22, while earlier research in Indian youngsters showed a male to female ratio ranging from 1:2.9 to 1:3. [8,9,10] However, a different Scottish research found that patients under the age of 22 had a ratio of 1:2.8.[11] Our study was hospital-based, and referral bias may have contributed to the observed epidemiological differences. Goiter was present in only 16% of individuals with thyroid dysfunction in this study. As contrasting to a previous research [12] that found that 38% of children with thyroid hormone abnormalities had goiter. Possible explanations for this disparity include variations in the local prevalence of iodine deficiency. The prevalence of hypothyroidism was observed in 63(91.3%) in our study was higher as compared to the study conducted in India in which 79% frequency was reported.[10] One explanation would be that there were no euthyroid goiter individuals in our samples, which led to a disproportionately high percentage of hypothyroidism cases. In this study 6(8.6%) children had hyperthyroidism. This is supported by a previously published study on Indian children that found a percentage between 2.5 to 10%.[10] The clinical characteristics of individuals with hypothyroidism are quite similar to those of the previously published Indian study.[13] Children with hypothyroidism were found to use iodized salt at a low rate (70%) but all children with hyperthyroidism were iodized salt users. Although the iodine content of the salt samples was not tested, the low rate of iodized salt intake should raise concerns as it may be the cause of hypothyroidism. Anemia was checked for in hypothyroidism individuals. Anemia was observed in 20 (31.74%) of the hypothyroid children. But according to the research currently accessible, the prevalence is between 20% and 60%.[14] In our study microcytic, hypochromic RBCs were seen in all anemic individuals, and 46 (73.4%) hypothyroid youngsters had indications of iron deficiency. These findings are with contrast with the previous research.[15] There were certain limitations identified in this study that need to be highlighted. The research's power was limited by two factors first, because it was conducted in a hospital, the participants might not be representative of the entire population; and second, there were not many study participants. The most frequent abnormality identified by thyroid scintigraphy was dyshormonogenesis. Due to their autosomal recessive nature, such cases require genetic counselling and sibling assessment.[16]

CONCLUSION

Our study concluded that the thyroid disorders are most prevalent in children (13.7%), and further studies of this kind from other parts of the country with larger populations are really needed.

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This article may be cited as: Punhal M, Ali N, Jan S, Halim A, Bibi S, Shabbir MG: Prevalence of Thyroid Disorders in Children at a Tertiary Care Hospital. Pak J Med Health Sci, 2023; 17(12): 127-129.