

Original research article

“A Prospective Observational Study About Assessment of Prevalence and Clinico-Etiological Parameters of Disorders of The Thyroid Gland in Children, At A Southern Rajasthan Hospital”

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Abstract

Introduction: Thyroid hormone abnormalities are commonest endocrine disorders in India and also the commonest preventable cause of mental retardation. Objectives-To determine the prevalence, clinical profile and etiology of thyroid dysfunction in children.

Materials and Methods: A hospital based prospective observational study performed in newborns and children below 18 years fulfilling the inclusion criteria visiting the pediatric OPD and IPD in Ananta Institute of Medical Science & Research Centre Rajsamand, Rajasthan. If they had clinical suspicion of thyroid dysfunction. Patients having normal TSH levels defined by age wise cut offs were not evaluated further. Thyroid profile consisting of Free T4 , Total T4,TSH levels were done if there was suspicion of hypothyroidism and Free T3 and TSH if there was suspicion of hyperthyroidism. Other investigations like USG thyroid, thyroid 99^m technetium scan anti TPO and anti TG antibody levels were done to look for the etiological diagnosis. Appropriate treatment was started according to standard guidelines.

Results: Out of 252, 35 children were found to have thyroid dysfunction, 34 were having hypothyroidism and 01 was having hyperthyroidism. Overall male to female ratio in our study was 1:4. Most common clinical presentation in hypothyroidism cases were constipation followed by short stature. Autoimmune hypothyroidism was the most common etiology. Prevalence of goiter in the study was 20%. 07 cases were congenital hypothyroidism. Treatment was started according to standard guidelines.

Conclusion: Autoimmune thyroid diseases are now the major leading cause of thyroid disorders in childhood. There is high prevalence of thyroid dysfunction in children in and around the rajsamand.

Key words: Autoimmune thyroid diseases, thyroid dysfunction, thyroid stimulating hormone.

Introduction

Disorders of thyroid gland are commonest endocrine disorder in India.¹In pediatric age group thyroid hormones are primarily concerned with maintenance of growth, metabolism and mental development^{2,3}. Thyroid hormones deficiency in infancy leads to irreversible impairment of neuro-cognitive function and physical and mental retardation³. It is a spectrum of disorders manifesting either as hypo or hyper functioning of the thyroid gland reflected in the circulating levels of Tri-iodothyronin (T3), Thyroxin (T4) and Thyroid stimulating hormone (TSH). The disorders of thyroid hormone can be due to diseases of the thyroid gland itself (primary), secondary to pituitary disorder (secondary) or due to hypothalamic diseases (tertiary)⁴. Congenital hypothyroidism is the most common preventable cause with worldwide incidence of 1:3000-4000. In India this ratio is 1:2500 - 2800^{2,3}. Hypothyroidism after the age of three years when most of the brain development is completed, their deficiencies leads to slow growth and delayed skeletal maturation³. Autoimmune thyroid diseases are now major leading cause of thyroid disorders in childhood and now considered the most common cause of acquired hypothyroidism. They include Hashimoto thyroiditis and lymphocytic thyroiditis. Their clinical manifestations range from euthyroid goiter to hypo or hyperthyroid state^{5,6}. Hyperthyroidism is rare in children and if present it causes rapid linear growth and skeletal maturation due to increase metabolic activity^{5,7}.

Aims and objectives

1. To Study the prevalence of thyroid disorders in children.
2. To study the etiology and clinical profile of thyroid disorders in children.

Methodology

Source of data:

A hospital based observational study was performed in newborns and children below 18 years fulfilling the inclusion criteria visiting the Paediatric outpatient department [OPD] and in patient department [IPD] in Ananta Institute of Medical Science & Research Centre Rajsamand Rajasthan, having clinical suspicion of thyroid dysfunction from January 2019 to December 2019(12 months). Patients having clinical features suggestive of thyroid disorders

like constipation, short stature, lethargy, goiter, mental retardation, obesity, prolonged neonatal jaundice, palpitations etc were enrolled in the study. Thyroid profile consisting of TSH, free T4 and Total T4 is done if there is suspicion of hypothyroidism and in suspicion of hyperthyroidism thyroid profile consisting of TSH and free T3 is done. Patients having normal thyroid function test are not evaluated further in the study. Patients having abnormal thyroid function, which is defined as per the standard cut offs of free T3, total T4, free T4 and TSH according to different age groups³⁸ are evaluated further in the study and taken as a positive case. Later detailed demographic data (age, sex, address) including family history of thyroid disorders, use of iodised salt, vital parameters, anthropometry, systemic examination, examination of the thyroid gland was performed. Further tests like complete blood count in cases is done. Anaemia is defined according to WHO guidelines³⁹. Anaemia is graded as mild, moderate and severe depending upon the age and sex wise cut offs. USG thyroid was done in all the positive case and looked for presence of goiter. In case of suspicion of congenital hypothyroidism the patient is subjected to ^{99m} technetium scan. In cases of suspected autoimmune etiology tests like anti thyroid peroxidase antibodies (anti TPO) and anti thyroglobulin antibodies (anti TG) are performed in the patients. Normal reference values of anti TPO levels is < 35 IU/ml and anti TG antibody levels is < 20 IU / ml⁴⁹. All the diagnosed patients are treated as per guidelines³¹.

Selection criteria of the patients:

Inclusion Criteria:

1. Newborns.
2. Children below 18 years of age.

Exclusion Criteria:

1. Patient on any medication altering the thyroid hormone status.
2. Patient in whom informed consent could not be obtained.

These 252 patients were selected from OPD and IPD having clinical suspicion of thyroid dysfunction visiting at Ananta Institute of Medical Science & Research Centre Rajsamand, Rajasthan. Of these 252, cases having abnormal thyroid function test were evaluated further.

Data analysis and interpretation:

Data was entered into Microsoft Excel (Windows 8; Version 2012) and analysis was done using the Statistical Package for Social Sciences (SPSS) for windows software. Descriptive statistics such as mean and standard deviation (SD) for continuous variables, frequencies and percentages were calculated for categorical variables were determined. Bar charts and pie charts were used for visual representation of the analyzed data.

Results

Table 1: Distribution of Study Subjects according to the Age wise TSH Level (Prevalence)

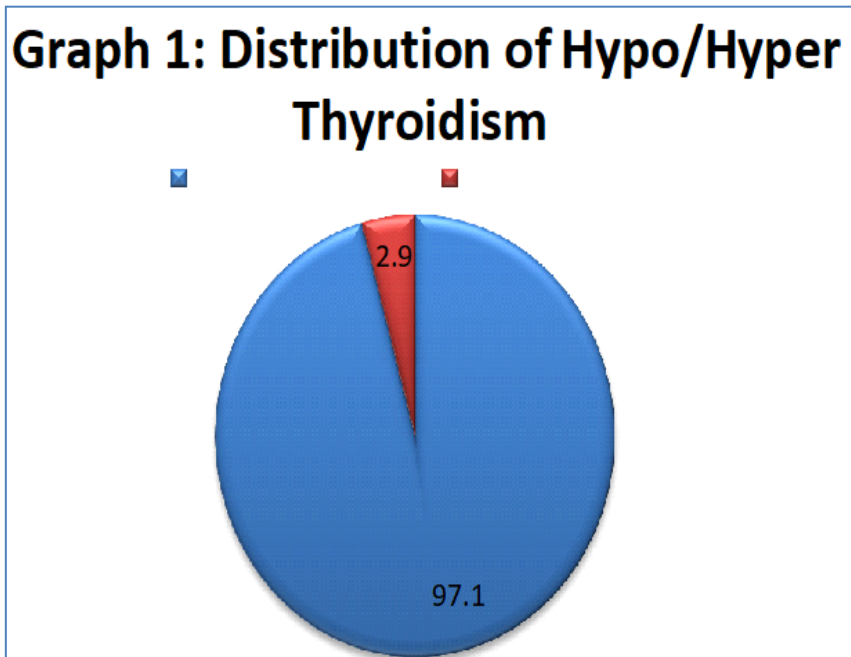
Age wise TSH Levels	No.	Percent
Normal	217	86.1
Abnormal	35	13.9

Out of 252 patients screened, 217 (86.1%) patients had normal TSH levels and 35(13.9%) patients had abnormal TSH levels. In our study, Prevalence was 13.9%. Patients with abnormal TSH were evaluated further in the study.

Table 2: Distribution of Study Subjects according to the Gender (N=70)

Gender	No.	Percent
Female	28	80
Male	07	20

Out of 35 cases 07 were male (20%), and 28 were female with (80%) with over all Male:Female ratio of 1:4.



Out of 35 cases, 34 cases (97.1%) were hypothyroidism and 01 cases (2.9%) was hyperthyroidism.

Table 3: Distribution of Hypothyroidism Study Subjects according to Signs and Symptoms (N=34)

Chief Complaints	No.	Percent
Constipation	19	55.8
Short stature	17	50.0
Dry skin	16	47.0
Lethargy	15	44.1
Cold intolerance	13	38.2
Swelling in the neck	09	26.4
Goiter	07	20.5
Non-pitting edema	05	14.7
Fatigue	05	14.7
Developmental delay	04	11.7
Pallor	03	8.8
Abnormal weight gain	03	8.8
Polyuria	01	2.9
Umbilical hernia	01	2.9
Not gaining height	01	2.9
Delayed dentition	01	2.9
Not gaining weight	01	2.9
Bradycardia	01	2.9
Change in voice	01	2.9
Prolonged neonatal jaundice	01	2.9

Only 01 case belongs to hyperthyroidism that had increased frequency of stools, heat intolerance, hyperactivity, tachycardia, short stature, pallor & swelling of the neck. 02 out of 35 cases had family history of thyroid disorders (5.7%) and 33 cases had no family history of thyroid diseases (94.2%). All the 02 were hypothyroid cases. Out of 35 cases, 07 cases had

thyroid enlargement on examination (20%), 28 cases had no thyroid enlargement (80%). In our study out of 35 cases, 51.4% had height < 3rd percentile and 45.7% patients had weight < 3rd percentile.

Table 4: Distribution of Study Subjects according to the Haemoglobin (N=35)

HB (in g%)	No.	Percent(%)
Normal	11	31.4
Mild	13	37.1
Moderate	08	22.8
Severe	03	08.5

Out of 35 cases, 24 cases had anaemia, 13 cases with mild anaemia (31.4%), 08 cases with moderate anaemia (22.8%), 03 cases with severe anaemia (8.5%), 11 cases were having normal

haemoglobin levels (31.4%). Out of 35 cases, 07 cases had goiter (20%), 03 had hypoplastic features (8.5%) and 25 cases were having normal USG thyroid (7.4%).

Table 5: Distribution of Study Subjects according to Thyroid 99^m Technetium scan (N=07)

99 ^m technetium scan	No.	Percent(%)
Thyroid Dysgenesis	05	71.4
-Aplasia	01	20
-Hypoplasia	03	60
-Ectopic	01	20
Dyshormonogenesis	02	28.5

Out of 07 cases with Congenital Hypothyroidism, 05 cases (71.4%) are Thyroid Dysgenesis, followed by Dyshormonogenesis in 02 cases (28.5%). In 05 cases of Thyroid Dysgenesis 03 are hypoplastic (60%), 01 cases aplasia (20%) and 01 ectopic thyroid (20%).

Table 6: Distribution of Study Subjects according to the Diagnosis (N=35)

Diagnosis	No.	Percent
<i>Autoimmune hypothyroidism</i>	27	77.1
<i>-with Goiter</i>	07	25.9
<i>-without Goiter</i>	20	74.1

<i>Hyperthyroidism</i>	01	02.8
-without goiter	01	100.0
-with Goiter	00	0.0
<i>Congenital Hypothyroidism</i>	07	20
-with thyroid dysgenesis	05	71.4
-with dysmorphogenesis Thyroid dysgenesis	02	28.6
<i>aplasia</i>	05	
<i>hypoplasia</i>	01	20
<i>ectopia</i>	03	60
	01	20

Out of 35 cases , 27 (77.1%) are autoimmune hypothyroidism in which 20 (74.1%) cases had no goiter and 07 had goiter (25.9%), 07 (18.6%) are congenital hypothyroidism, 05 cases are Thyroid Dysgenesis (71.4%), 02 cases are Dyshormonogenesis(28.6%). Out of 35 cases, 01 cases (2.8%) are hyperthyroidism without goiter (100%). Out of 05 cases of thyroid dysgenesis, 03 cases are from Hypoplasia, 01case is belongs to aplasia & ecopia of thyroid gland.

Table 7: Distribution of Study Subjects according to the Anti-Thyroid Antibodies (N=28)

Anti-Thyroid Antibodies	No.	Percent
Elevated anti-TPO	22	78.57
Elevated anti TG	24	85.71
Anti TPO positive Anti TG negative	03	10.71
Anti TG positive Anti TPO negative	05	17.85

Out of 28 cases of suspected autoimmune etiology, 22 (78.57%) cases had elevated anti TPO antibody levels, and 24 (85.71%) cases had elevated anti TG antibody levels. Out of 28 cases, 03 (10.71%) cases are positive for anti TPO antibodies but negative for anti TG antibodies where as 05(17.85%) cases are positive for anti TG antibodies but negative for anti TPO antibodies.

Discussion

PREVALENCE: Out of 252 patients tested having suspicion of thyroid dysfunction, 35 children had abnormal thyroid dysfunction, 34 were hypothyroid and 01 was hyper thyroid. Estimated Prevalence in our study is 13.88%. While results of Amitabh singh et al (2016) was 13% prevalence of thyroid disorders in children at a tertiary care hospital in western

India. **MALE: FEMALE RATIO:** Thyroid disorders are well known to be more in female than male of all age groups⁴. In our study, out of 35 cases, 07 are Male (20%) and 28 are Female (80%). Overall Male: Female ratio was 1:4. In a Study done by Ian Hunter et al⁴⁰ on Prevalence and aetiology of hypothyroidism in the young noted that out of 140 cases 37 were male and 103 were female and the male to female ratio was 1:2.8. In a study done by kapil U et al⁴¹ on Assessment of iodine deficiency in Ernakulam district, Kerala state noted that out of 1254 children between age group of 6-12 years for the prevalence of IDD in children, the male to female ratio was 1:2.9. In a study done by Meena desai⁶ on Autoimmune Thyroid Disease In Childhood noted that out of 78 cases 58 were female and 20 male, the male to female ratio was 1:2.9. In a study done by R. K. Marawah et al⁴² on Prevalence of thyroid diseases in children noted that out of 122 diagnosed, 14 children were male (11.47%) and 108 were female (83.52%) the male to female ratio was 1:7.7. **SIGNS AND SYMPTOMS:** In our study, out of 34 cases of hypothyroidism, the most common clinical presentation in patients is constipation (55.8%) followed by short stature (50%). In a study done by Desai MP et al³⁰ on disorders of thyroid gland in India noted that most common clinical presentation was constipation (87%) followed by lethargy (55%). In a study done by Amitabh Singh et al⁴³ on prevalence of thyroid disorders in children noted that out of 61 hypothyroid cases the most common clinical presentation was short stature (59%) followed by lethargy (49.2%). In a study done by Virmani A et al³² on Profile of thyroid disorders in a referral centre in North India noted that the most common clinical presentation was short stature (44%). In our study, Only 01 case belongs to hyperthyroidism that had increased frequency of stools, heat intolerance, hyperactivity, tachycardia, short stature, pallor & swelling of the neck. In a study done by Amitabh Singh et al⁴³ on prevalence of thyroid disorders in children noted that out of 4 cases of hyperthyroidism, the most common clinical presentation was tachycardia (100%), followed by palpitations (75%). **FAMILY HISTORY:-**In our study out of 35 cases, 02 cases (5.7%) had family history of thyroid disorders. In a study done by Amitabh singh et al⁴³ on prevalence of thyroid disorders in children noted that 4 cases (6.5%) had family history of thyroid disorders. **GOITER:-**In our study out of 35 cases, 07 (20%) children with thyroid dysfunction had thyroid gland enlargement which was confirmed by ultrasound thyroid showing goiter. In a study done by Desai MP et al³⁰ on Disorders of thyroid gland in India reported prevalence of goiter in 38% children with thyroid hormone abnormalities. In a study done by R. Pradhan et al⁴⁴ on Assesment of iodine deficiency disorders in urban areas of Udaipur district Rajasthan, India noted that the prevalence of goiter was 25%. Similarly in a study done by Shah NA et al³³ on Evaluation of thyroid diseases by hormonal analysis in Paediatric age group noted that out of 16 cases, 3 cases had prevalence of goiter (5%). **ANEMIA:-**Anaemia is known to be associated with hypothyroidism⁴⁵. The common type of anaemia found in hypothyroidism is anaemia of chronic disease⁴⁶. In our study out of 35 cases, prevalence of anaemia was found to be 24 (68.5%). In a study done by Amitabh singh et al⁴³ on prevalence of thyroid diseases in children noted that the prevalence anaemia was (31.1%). While the available literature suggest the prevalence to be higher (20 -60%)⁴⁷. **THYROID 99^m TECHNETIUM SCAN** -In our study out of 35 cases, thyroid 99^m Technetium scan is done in 07 patients, out of which 05 (71.4%) are Thyroid Dysgenesis followed by Dyshormonogenesis in 02 cases (28.5%). Out of 05 cases of thyroid dysgenesis

03(60%) have thyroid hypoplasia , 01 (20%) have aplasia and 01 (20%) case of ectopic thyroid .Where as in study done by Amitabh singh et al⁴³ on prevalence of thyroid disorders in children noted that thyroid scintigraphy was done in 35 patients and most common finding was dysmorphogenesis (46 %). **DIAGNOSIS:-**In our study out of 35 cases with thyroid dysfunction, 34 cases (97.1%) were hypothyroidism and 01 cases (2.8%) were hyperthyroidism.In a study done by Desai MP et al³⁰ on Disorders of thyroid gland in India noted that out of 800 cases 79% were having hypothyroidism and 2% were having hyperthyroidism.In a study done by Shah NA et al³³on Evaluation of thyroid diseases by hormonal analysis in paediatric age group noted that out of 16 cases 6 cases were having hypothyroidism(37.5%) and 1 case had hyperthyroidism(6.25%).In a study done by Amitabh Singh et al⁴³ on prevalence of thyroid disorders in children noted that Out of 65 cases , 61 cases were having hypothyroidism (93.8%) and 4 cases were having hyperthyroidism (6.1%).In a study done by Meena P Desai and Swati karandhikar⁶ on Autoimmune thyroid disease of childhood noted that Out of 77 cases, 60 children (77%), had hypothyroidism and 8 cases (10%) had thyrotoxicosis.In our study, out of 34 cases of hypothyroidism, 27 cases were autoimmune hypothyroidism (77.1%), and 07 cases were congenital hypothyroidism (19.5%).In a study done by Meena P et al⁶ on Autoimmune thyroid disease in childhood noted that 40% cases were autoimmune hypothyroidism and 46% cases were congenital hypothyroidism. **ANTI THYROID ANTIBODIES-** In our study of 35 cases, 28 cases suspected of having autoimmune etiology are subjected to anti TPO and anti TG levels, 22 cases (78.57%) had elevated anti TPO antibodies and 24 cases (85.71%) had elevated anti TG antibodies. In a study done by Meena Desai et al⁶ on Autoimmune thyroid disease in childhood noted that out of 96 cases, 66 cases (68.7%) were having anti thyroid antibodies positive. Anti TPO antibodies positivity were more common than anti TG antibodies. Out of 57 cases, 6 (10.52%) cases are positive for anti TPO antibodies but negative anti TG antibodies where as 11(19.29%) cases are positive for anti TG antibodies but negative for anti TPO antibodies. In study done Meena P et al⁶ anti thyroid antibody levels of 1:100 were considered significant and taken as positive case. **TREATMENT-**All the cases of hypothyroidism were treated with tablet levothyroxine and hyperthyroidism cases with Carbimazole according to standard guidelines³¹. Iron, calcium and vitamin D3 supplementation was given to the patients. Review of literature reveal that in India less than 10% cases of congenital hypothyroidism are diagnosed by the age of 3 months and only about 50% by the age of 2 years ^{34,48}.lack of awareness amongst the primary health care practitioners and family physicians was one of the important reasons for delayed diagnosis ³⁴.

Conclusion

Thyroid hormones estimation is very useful in diagnosis of various thyroid disorders in children with clinical suspicion of thyroid dysfunction. Thyroid hormones are unique in view of their role in fetal development and early neonatal brain development and also having actions on growth and developmental during the first two decades of life. Congenital hypothyroidism is one of the major preventable thyroid diseases if diagnosed early. Hence screening of all newborns and children should be mandatory as early diagnosis and treatment helps in prevention of mental retardation and other complications of thyroid disorders. Other

thyroid diseases commonly seen in pediatrics age group are autoimmune thyroiditis, goiter and rarely hyperthyroidism. Autoimmune thyroid disorders are now emerged as a leading cause of thyroid disorders in pediatric age group. Many cases have been encountered in our study where in patients with autoimmune thyroid disorders are having anti TPO antibodies negative but anti TG antibodies positive. Out of 252 patients having clinical suspicion of thyroid dysfunction, 35 cases had thyroid function abnormalities and after subjecting these 35 patients for further tests based on the suspected etiology we found out 34 cases as hypothyroidism and 01 case as hyperthyroidism.

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