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Demographic and Clinical Profile of Hypothyroidism, Congenital and Acquired

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Abstract: This prospective, hospital based study was carried out in index medical college, hospital and research centre, Indore in paediatric department after taking informed and written consent. All children attending pediatric opd was evaluated on the basis of clinical suspicion and history and those who were diagnosed with hypothyroidism were included and based on demographic data, a clinical profile was created based on their presenting complaints, clinical picture investigations and complications. Thyroid hormones (TH) are critical for early brain development, somatic growth, and bone and pubertal maturation. Some diseases are better prevented than treated. Congenital hypothyroidism is one of such New born screening, early detection and prompt intervention of developmental delay with consequent prevention of mental retardation in CH can transform the outlook of children with CH so severe growth retardation and mental handicap is no longer seen. A total of 70 patients were diagnosed to have hypothyroidism, out of which 42 were acquired and 28 were congenital hypothyroidism. In both the types it was found that it was more common in females 50 cases (71.4%) compared to 20 (28.6 %) males, chi square revealed p value 0.002 (p value<0.05). Growth failure was present in all the cases, in71 % (50) cases height was found to be less than 3rd standard deviation, p value was 0.047(p value <0.05). Milestones were delayed in 45.7 % (32) children p value 0.0689(p value >0.05). Anaemia was seen in 68.5 % (48) p value 0.0001(p value<0.05), bone age was delayed in 48.5 % (34) p value 0.001(p value <0.05), family history of thyroid disorder was present in 25.7% (18) p value 0.623 (p value >0.05), although family history of hypothyroidism is common but in our case it was not found to be significant. History of neonatal jaundice was present in 20 % (14) children. 34.2 % children presented with history of chronic constipation and 20% with poor school performance. On sonographic evaluation of thyroid gland 14 children were found to have either hypoplastic or agenesis of thyroid gland.

Keywords: Congenital Hypothyroidism, Acquired Hypothyroidism & Neonatal Screening.

INTRODUCTION

Endocrine abnormalities are a very common in India and with thyroid dysfunction being the most common of all endocrine abnormalities [1]. The disorder of thyroid gland could be due to disease of thyroid gland itself (primary) or secondary to pituitary disorder (secondary) or due to hypothalamic disease (tertiary). Hypothyroidism is congenital or acquired and may or may not be associated with goitre. Most primary CH is due to either to abnormal development of the gland itself –dysgenesis, agenesis, or to deficiency in one of the enzyme of thyroid biosynthesis within structurally normal thyroid gland- dyshormonogenesis [2].

Clinical manifestations of congenital hypothyroidism in the immediate new born period usually are subtle but becomemore evident weeks or months after birth. By then it is too lateto ensure that there is not a detriment to the infant's cognitivedevelopment [1]. New born screening is crucial to make an early diagnosis and initiate thyroid replacement therapy by youngerthan 01 month of age. Findings at various stages after birth include hypothermia, acrocyanosis, respiratory distress, large fontanels, abdominal distention, lethargy and poor feeding, prolonged jaundice, Oedema, umbilical hernia, mottled skin, constipation, large tongue, dry skin, and hoarse cry, choking spells, hypoglycaemia and its effects. Thyroid hormones are crucial for maturation and differentiation of tissues, suchasbone and brain. When treatment with levothyroxine is initiated within 1 month or less after birth, the prognosis for normal intellectual development is excellent; screening programs usually offer therapy within 1 to 2 weeks of birth. If Therapy is instituted after 6 months, when the signs of severe hypothyroidism are present, the likelihood of normal intellectual function is markedly

decreased. Growth Improves after thyroid replacement even in late diagnosed cases.

Thyroid hormone is very important due to its role in growth and development, metabolism and brain development. Congenital hypothyroidism is the most common preventable cause of mental retardation [6]. Hypothyroidism in later years where brain development is complete, leads to growth failure, short stature due to delayed skeletal maturation. Growth failure is a well-recognized consequence of hypothyroidism during childhood and may be the presenting feature.TH potentiate GH stimulation of the synthesis and action of insulin-like growth factor 1 (IGF1) and stimulation of the production of different growth factors (epidermal growth factor, nerve growth factor, and erythropoietin). Cartilage response to IGF1 and osteoblastic/osteoclastic bone remodeling are also regulated by thyroid hormones. The bone age is usually grossly delayed; though many children with hypothyroidism have a reasonably normal growth potential once the disorder is identified and treated.

The prevalence of anaemia in patient with hypothyroidism has shown to be 20-60% [4]. Thyroid hormones involve in haemoglobin synthesis in adults and maturation of hemoglobin in foetus [3, 4] and by affecting hematopoietic process, hypothyroidism results in anaemia through slowing the oxygen metabolism [5]. Hypocoagulopathy, haemorrhages, malabsorption of iron, vitamin b12 and folic acid and reduced erythropoietin and bone marrow haematopoietic cells hypoplasia can cause anaemia [5]

Table-1: Signs and Symptoms of Hypothyroidism

• Ectodermal	• Circulatory
Poor growth, dull facies, thick lips, large tongue, depressed nasal bridge	Sinus bradycardia
Dry scaly skin	Cold extremities
Sparse brittle hair	Cold intolerance
Diminished sweating	Pallor
Carotenemia, vitiligo	Ecg changes low voltage QRS complex
• Neuromuscular	
Muscle weakeness	Developmental delay
Hypotonia, constipation, pot belly	Delayed relaxation of reflexes
Umbilical hernia	Paraesthesia
Myxedema coma	Cerebellar ataxia
Pseudo hypertrophy of muscles	• Skeletal
Myalgia	Delayed bone age
Physical and mental lethargy	Epiphyseal dysgenesis
	Wormian bones
• Sexual development	
Menstrual irregularity	
Precocious puberty	
• Metabolic	• Laboratory
Myxedema	Elevated CK
Serous effusion	Macrocytic anaemia
Hoarse voice, cry	Hypercholesterolemia
Weight gain	Hyperprolactinemia
Arthralgia	

MATERIALS AND METHODS

This prospective, hospital based study was carried out in index medical college, hospital and research centre, Indore in paediatric department after taking informed and written consent. Study was done for a period of 2 year. All children attending pediatric opd was evaluated on the basis of clinical suspicion and history and those who were diagnosed with hypothyroidism were included and based on demographic data, a clinical profile was created based on their presenting complaints, clinical picture investigations and complications.

A total of 439 children were evaluated and 70 children were diagnosed with hypothyroidism during this period. For These children demographic data (age sex address) including family history, use of iodised salt, data related to symptoms suggestive of thyroid dysfunction were recorded. Anthropometric measurements were taken and compared with growth charts. Thorough history and physical examination were recorded on a predesigned proforma.

These children were evaluated for their somatic growth, developmental milestones neurocognitive function, anaemia and other complications.

Various parameters of the child were compared on the basis if child is a case of congenital or acquired hypothyroidism. Relevant investigations were done according to the case profile and complaints.

All patients with thyroid dysfunction were assessed for bone age and anaemia. Those patient suspected also underwent thyroid ultrasound for hypoplastic or agenesis of thyroid gland.

All children diagnosed with hypothyroidism were started on oral thyroxine and followed over a period of time to asses the beneficial effects of treatment on growth and development of the child.

Exclusion criteria: all cases where informed consent could not be taken or who were already on medication or any other medication.

RESULTS

A total of 70 patients were diagnosed to have hypothyroidism, out of which 42 were acquired and 28 were congenital hypothyroidism. In both the types it was found that it was more common in females 50 cases (71.4%) compared to 20 (28.6 %) males, chi square revealed p value 0.002 (p value<0.05). Growth failure was present in all the cases, in71 % (50) cases height was found to be less than 3rd standard deviation, p value was 0.047(p value <0.05). Milestones were delayed in 45.7 % (32) children p value 0.0689(p value >0.05). Anaemia was seen in 68.5 % (48) p value 0.0001(p value<0.05), bone age was delayed in 48.5 % (34) p value 0.001(p value <0.05), family history of thyroid disorder was present in 25.7% (18) p value 0.623 (p value >0.05), although family history of hypothyroidism is common but in our case it was not found to be significant. History of neonatal jaundice was present in 20 % (14) children. 34.2 % children presented with history of chronic constipation and 20% with poor school performance. On sonographic evaluation of thyroid gland 14 children were found to have either hypoplastic or agenesis of thyroid gland.

Table-2: Distribution of patients

	Congenital (28)	Acquired (42)
Male	6	14
Female	22	28
Height <-3 SD	10	24
Delayed milestones	18	4
Anaemia	22	26
Neonatal jaundice	10	4
Chronic constipation	8	16
Poor school performance	-	14
Goitre	-	1
Excessive weight gain	-	16

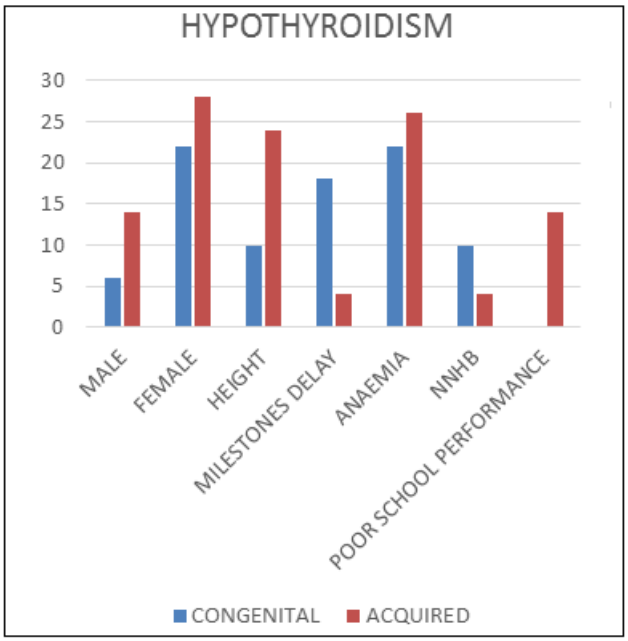

Fig-1: Distribution of patients

Most common presentation in acquired hypothyroidism was growth retardation, delayed bone age with anaemia and poor school presentation with weight gain and loss of interest in doing activity. On the contrary in congenital hypothyroidism delayed milestones is the most common presentation with neurocognitive dysfunction and anaemia with a history of prolonged neonatal jaundice.

Table-3: On follow up after treatment initiated with thyroxine.

	Before treatment	After treatement
Somatic growth	Growth retardation	Increase in growth velocity
Bone age	Delayed	Growth achievement
Neurocognitive functions	Delayed milestones, learning disability, delayed motor response, lethargic, poor school performance	Achievement of milestones, increase in activity, not much improvement in learning skills and little improvement in IQ scores. Some improvement in school performances
Anaemia	Moderate macrocytic anaemia	Mild to no anaemia
Other complaints	Constipation Umbilical hernia Weight gain Skin and voice changes	Relieved Relieved Weight loss but not significant Improvement

Children with congenital hypothyroidism showed good response to treatment with thyroxine. Milestones were achieved and growth acceleration was noticed after thyroxine, but neurocognitive dysfunction that was already present due to brain damage was not completely reversed and many children with Mental retardation who presented in later age were not benefitted [9].

DISCUSSION

Thyroid hormones (TH) are critical for early brain development, somatic growth, and bone and pubertal maturation. Some diseases are better prevented than treated. Congenital hypothyroidism is one of such New born screening, early detection and prompt intervention of developmental delay with consequent prevention of mental retardation in CH can transform the outlook of children with CH so severe growth retardation and mental handicap is no longer seen [10].

In this hospital based prospective study 70 (16%) children out of 439 were diagnosed to have hypothyroidism. Thyroid disorder is well known to be more prevalent in females. In our study overall male is to female ratio was 1:1.5 which is similar to study conducted by Amitabh Singh *et al*., which was 1:1.2. Previous reports in indian literature demonstrates male: female ratio of 1:2.9, 1: 3.4 [2, 13, 14]. Chanchal das *et al*., reported 70.65 % were females.

In this study we found that most of the cases of acquired hypothyroidism presented with growth retardation, delayed bone age with anaemia and poor school presentation with weight gain and loss of interest in doing activity.

Anaemia in patient with hypothyroidism varies between 20-65% and in our study it was 68.5 %. Study done by kazemijahromi *et al*., reported anaemia in 61.4% indicating a high correlation between hypothyroidism and anaemia. Study conducted by jinhiu chu 65 % adolescent cases had anaemia

Dugbartey *et al*., 1998 reported that untreated congenital hypothyroidism causes profound mental retardation characterized by severe cognitive deficits. Although early identification and treatment of congenital hypothyroidism has been known to improve scores on formal tests of intelligence (eg. Raven progressive matrices test, mill hill vocabulary scale, weshsler intelligence scale continuous visual memory test etc,) [6], there is still evidence of neurocognitive deficits in attention, visuospatial processing, motor dexterity, and language comprehension skills that may persist through late childhood and in some cases adolescence. Hypothyroidism is associated with deficits in memory, psychomotor slowing, and visuo-perceptual and constructional skills [6].

Similar results were noted in our study. Most of the children of congenital hypothyroidism regained proper growth velocity on follow up, after initiation of thyroxine, but complete improvement in neurocognitive function was not seen. Many of these children had poor IQ and delayed milestones and learning disability on follow up even after therapy with thyroxine was started. There was also improvement in other clinical features like anaemia constipation etc [11].

He also reported that neuroplasticity varies directly with age, favouring infants over older individuals. Thus, although certain sensorineural deficits such as hearing loss may occur in both congenital and adult hypothyroidism, the developmentally based neurocognitive expression of such deficits, including treatment responses, may differ remarkably in these populations. This variability in treatment response and partial recovery may have more severe delayed neurobehavioral consequences in congenital hypothyroidism [12].

NEONATAL SCREENING

Newborn screening (NS) for congenital hypothyroidism (CH) is one of the major achievements in preventive medicine. Most neonates born with CH have normal appearance and no detectable physical signs. Hypothyroidism in the new born period is almost always overlooked, and delayed diagnosis leads to themost severe outcome of CH, mental retardation, emphasizing the importance of New born screening [7, 8]. Blood spot thyroid stimulating hormone (TSH) or thyroxine (T4) or both can be used for CH screening. The latter is more sensitive but not cost-effective, so screening by TSH or T4 is used in different programs around the world [15]. Blood is obtained from a heel, the ideal time to obtain the blood spot is 3-5 days after birth to minimize the false positive high TSH values [16].

CONCLUSION

Congenital hypothyroidism is one of the most common preventable cause of short stature with mental retardation .Early diagnosis and treatment with adequate doses of L-T4 have rescued affected children from a life of mental retardation. Neonatal screening for all neonates especially high-risk deliveries should be made compulsory for early recognition and timely treatment to prevent damage to brain and proper somatic growth to prevent short stature and other clinical problems. Thyroid hormone has an important role in bone development and linear growth in children and deficiency of thyroid hormone can lead to stunted Growth. Prompt recognition of the findings can lead to early and effective treatment, improving the short stature and skeletal manifestations.

Children diagnosed as having hypothyroidism have a greater likelihood of experiencing educational difficulties. Comprehensive neuropsychological evaluations can provide useful suggestions regarding the extent to which any difficulties with learning and memory, fine-motor skills (which influence writing abilities), phonetic, or other linguistic skills can be circumvented in the academic setting.

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