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Original Research Article

Frequency of Hypothyroidism in Children with Down Syndrome Presenting in Tertiary Care/ Hospital

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Abstract:

Objective: To determine the frequency of Hypothyroidism in Children with Down Syndrome presenting in OPD of Children hospital Faisalabad.

Study Design Cross sectional study. Place and Duration of Study: Department of Pediatrics, Children hospital, Faisalabad, from 20th June 2025 to 19th August 2025.

Methodology: Total 85 children with Down syndrome of both genders and ranged in age from one month to five years were included. Individuals with Down syndrome who were already receiving therapy for hypothyroidism, had a mother's thyroid condition history, or had a history of birth asphyxia or cerebral palsy were excluded. To examine the T4 and TSH levels, a venous blood sample (4 ml) was obtained and examined at the hospital laboratory according to standard protocol. When TSH levels in newborns and those under 4 days old were greater than 10 mIU/L, hypothyroidism was classified as positive. 2–20 weeks, 1.0–17.6 mIU/L 0.6–5.6 mIU/L. Three days of free T4 full terms 2.0 to 4.9 ng/dL and 0.9-2.6 ng/dL in infants.

Results: The mean age in this study was 2.25 ± 1.56 years, with a range of 1 month to 5 years. With a male to female ratio of 1.9:1, 56 (65.88%) of the 85 patients were men and 29 (34.12%) were women. Our study's mean height was 87.96 ± 9.43 cm. Weight was 21.09 ± 4.53 kg on average. A mean BMI of 18.23 ± 3.21 kg/m2 was recorded. T4 (µg/dL) was 5.68 ± 0.49 on average. According to Table II, the mean TSH was 2.14 ± 0.18 mIU/L. In our investigation, 16 patients (18.82%) had hypothyroidism in children with down syndrome.

Conclusion: According to our research, a significant portion of children with Down syndrome also have hypothyroidism.

Keywords: Down syndrome, hypothyroidism, cardiac anomalies.

INTRODUCTION

Trisomy 21 is another name for Down syndrome (DS), a chromosomal abnormality brought on by one extra copy of chromosome 21 in human karyotype [1]. With a prevalence of 1 in 700–10000, Down syndrome is the fourth most prevalent genetic condition in the world. There are three forms of Down syndrome: 2-6% translocation, 2-4% mosaicism, and 95% nondisjunction. Down syndrome is more common in consanguineous marriages, oxidative stress, alcohol, smoking, older mothers, and specific diets [2]. This issue is also linked to a number of morbid illnesses, including congenital heart disease (CHD), hypothyroidism, congenital abnormalities, sleep apnea, congenital hip dislocation, atlanto-axial joint subluxation, acute megakaryocytic leukemia, and Alzheimer's disease [3,4]. Thyroid dysfunction is a prevalent endocrine disorder in children with Down syndrome that, if ignored, can significantly worsen the children's intellectual and developmental disabilities.

It is believed that between 4% and 19.5% of children with Down syndrome have thyroid problems [4]. Children with Down syndrome can have a wide range of dysfunctions, from overt conditions that need medical attention to temporary ones that just need careful observation. The range of thyroid dysfunction includes hyperthyroidism, auto-immune and non-auto-immune acquired hypothyroidism, congenital hypothyroidism, and subclinical hypothyroidism. Most studies on thyroid dysfunction in children with Down

syndrome have found that subclinical hypothyroidism is the most common kind [5].

Thyroid problems are linked to 13–50% of occurrences of Down syndrome. Thyroid illness is more likely to develop in subjects with Down syndrome. Thyroid disorders are 0.7–1% common in newborns with Down syndrome, 3-54% in children, and 12–30% in adults. In children with Down syndrome, the thyroid gland's inability to produce enough thyroid hormones and the delay in diagnosing hypothyroidism will affect their psychomotor development, somatic growth, and mental retardation [5]. Because Down syndrome symptoms and hypothyroidism symptoms are similar, frequent screening aids in identifying thyroid function issues early. In light of this, the American Academy of Pediatrics recommends that children with Down syndrome have their thyroid function checked at birth, six months, twelve months, and once a year [4] Consequently, it is essential to screen for thyroid abnormalities at the suggested interval. Newborns must be screened for thyroid disorders in various regions of the world [6]. The prevalence of hypothyroidism in children with Down syndrome who visit the National Institute of Child Health's outpatient department in Karachi was ascertained by Ahmed et al. The 104 children had a median age of 2 (1-4) years. 58 (56%) women and 46 (44%) men were present. Hypothyroidism was reported to be prevalent in 16 children (15.4%) [7]. Children's growth is impacted by the overlap between hypothyroidism and Down syndrome. In many parts of the world, it is therefore essential to screen for thyroid abnormalities at the appropriate interval; however, in underdeveloped nations such as Pakistan, this is not a standard practice. In order to identify thyroid function issues early, this study aims to determine the prevalence of hypothyroidism in children with Down syndrome.

METHODOLOGY

With approval from the ethical review committee, this descriptive cross-sectional study was carried out at the Children's Hospital Faisalabad's Outpatient Department between 20th June and 19th August of 2025. With the frequency of hypothyroidism in children with Down syndrome = 15.4%7, margin of error = 7.7%, and confidence level = 95%, the WHO sample size calculator indicates that the sample size is 85. Children with Down syndrome who had three clinical characteristics were included: a depressed nasal bridge, low-set ears, short, broad hands with short fingers and possibly a single palmer crease, an epicanthic fold (a rounded fold of skin in the inner corner of the eye), and an increased gap between one and two toes. The children were of both genders and ranged in age from one month to five years. Individuals with Down syndrome who were already receiving therapy for hypothyroidism, had a mother's thyroid condition history, or had a history of birth asphyxia or cerebral palsy were excluded.

Before being included in the study, all parents gave their informed consent after being informed of its goals and assured of the confidentiality of the data. Patients were chosen based on OPD's inclusion criteria. Every piece of clinical and demographic information was recorded on a pre-made proforma. To examine the T4 and TSH levels, a venous blood sample (4 ml) was obtained and examined at the hospital laboratory according to standard protocol. When TSH levels in newborns and those under 4 days old were greater than 10 mIU/L, hypothyroidism was classified as positive. 2–20 weeks, 1.0–17.6 mIU/L 0.6–5.6 mIU/L. Three days of free T4 full terms 2.0 to 4.9 ng/dL and 0.9-2.6 ng/dL in infants. The analysis of the data was done with SPSS version 25.0. The mean ± standard deviation was used to characterize quantitative variables such as age, height, weight, BMI, T4, and TSH values. The frequency and percentages of categorical characteristics, such as gender, cardiac anomalies, gastrointestinal anomalies, and hypothyroidism, were displayed. Hypothyroidism was compared using the chi-squared test. Stratification was used to adjust for effect modifiers such as age, gender, BMI, heart abnormalities, and gastrointestinal abnormalities. Their impact on hypothyroidism was examined using the post-stratification chi-square test. P values below 0.05 were regarded as significant.

RESULTS

The mean age in this study was 2.25 ± 1.56 years, with a range of 1 month to 5 years. With a male to female ratio of 1.9:1, 56 (65.88%) of the 85 patients were men and 29 (34.12%) were women. Table I displays the distribution of patients with additional confounding variables (Table 1).

Table 1. Distribution of different variables (n=85)

		Frequency	%age
Age (years)	1 month–3 years	51	60.0
	4-5 years	34	40.0
Gender	Male	56	65.88
	Female	29	34.12
BMI (kg/m2)	≤20	48	56.47
	>20	37	43.53
Cardiac anomalies	Yes	56	65.88
	No	29	34.12
Gastrointestinal anomalies	Yes	45	52.94
	No	40	47.06

Our study's mean height was 87.96 ± 9.43 cm. Weight was 21.09 ± 4.53 kg on average. A mean BMI of 18.23 ± 3.21 kg/m2 was recorded. T4 (µg/dL) was 5.68 ± 0.49 on average. According to Table II, the mean TSH was 2.14 ± 0.18 mIU/L (Table 2).

Table 2. Descriptive statistics

	Mean	SD
Age	2.25	1.56
Weight (kg)	21.09	4.53
Height (cm)	87.96	9.43
BMI (kg/m2)	18.23	3.21
T4 (µg/dL)	5.68	0.49
TSH (mIU/L)	2.14	0.18

In our investigation, 16 patients (18.82%) had hypothyroidism in children with down syndrome (Figure).

Figure. Frequency of Hypothyroidism in Children with Down Syndrome (n=85)

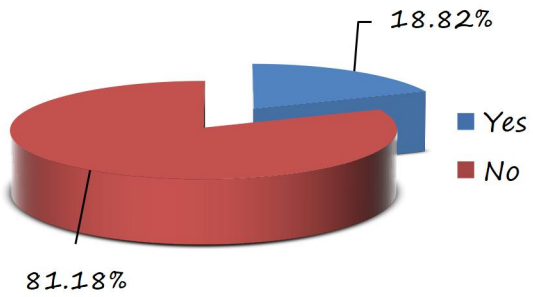

Table 3 displays the stratification of hypothyroidism by age, gender, BMI, heart abnormalities, and gastrointestinal abnormalities (Table 3).

Table 3. Stratification of Hypothyroidism with respect to age, gender, BMI, cardiac anomalies, gastrointestinal anomalies

		Yes (n=16)	No (n=69)	P-value
Age (years)	1 month to 3 years	11 (21.57%)	40 (78.43%)	0.428
	4-5 years	05 (14.71%)	29 (85.29%)	
Gender	Male	10 (17.86%)	46 (82.14%)	0.751
	Female	06 (20.69%)	23 (79.31%)	
BMI (kg/m^2)	≤20	09 (1 8.875%)	39 (81.25%)	0.984
	>20	07 (18.92%)	30 (81.08%)	
Cardiac anomalies	Yes	12 (21.43%)	44 (78.57%)	0.393
	No	04 (13.79%)	25 (86.21%)	
Gastrointestinal anomalies	Yes	10 (22.22%)	35 (77.78%)	0.395
	No	06 (15.0%)	34 (85.0%)	

DISCUSSION

A chromosome disorder that is among the most common is DS. Thyroid dysfunction and other multisystemic involvement can cause major morbidity if treatment is not taken.8 For children's growth, metabolism, and development—especially during infancy—thyroid hormone is crucial [9]. When DS manifests clinically in an older child, it may go undiagnosed because the symptoms can be confused with those of hypothyroidism [10].

In the current study, 16 individuals (18.82%) had hypothyroidism, which is common in children with Down syndrome. This was significantly less than the 34.5 percent thyroid dysfunction found in the earlier study conducted in Johannesburg, South Africa, and the 47.7 percent thyroid dysfunction found in a recent study conducted in Ethiopia [11]. Additionally, our local prevalence was lower than the 32.5% observed in comparable worldwide studies conducted in industrialized nations like California, USA [12,13]. However, it is crucial to remember that the inclusion of temporary instances might have led to a higher overall number of thyroid dysfunction cases in this study than

in the other studies. Children should be tested at birth, six months, twelve months, and then once a year, according to the American Academy of Pediatrics' current recommendation [14]. Because so many children were diagnosed between birth and two months, the Ethiopian study suggested that screening should include at least a test at two months [15]. In the general community, women are more likely than men to have thyroid disorders [16]. In contrast, thyroid abnormalities are more common in male children with DS than in female children.12 Similar results were found in the current investigation, despite the fact that they were not statistically significant. Subclinical hypothyroidism was the most frequent cause of thyroid problems. Numerous earlier investigations conducted at other schools have found similar results. This phenomenon can be explained by a short-term or transitory thyroid hormone deficit that eventually resolves due to increased thyroxine production [17].

The treatment of DS children with subclinical hypothyroidism is a topic of debate. Divergent opinions also exist regarding the threshold that should be applied when choosing a course of treatment. Because subclinical hypothyroidism is benign and self-remitting, some authors advise against treating it in children with Down syndrome. However, other authors contend that early treatment may be safe and can enhance intellectual function as well as growth and development in children with DS [18]. It is recommended that treatment be explored only for children with DS whose TSH is greater than 10 mU/mL and who have progressed from subclinical to overt hypothyroidism. For children with DS who exhibit symptoms, such as goitre or where antithyroid antibodies have been found, treatment is also advised [19]. Nonetheless, it is clear that a tiny proportion of kids with hypothyroidism might not develop antithyroid antibodies. When no treatment action is carried out, each case should be handled separately, and the clinical condition and TFTs should be checked on a regular basis [20].

It is known that almost every organ system in the human body can be impacted by DS. These children's quality of life is greatly impacted by the proper care of their comorbidities [21]. Congenital heart disease was the most prevalent comorbidity among the children included in this study. To appropriately test for all potential disorders linked to DS, a child with the syndrome should see a pediatrician for additional assessment at least once [22]. The relationship between hypothyroidism and CHDs was also investigated in this study, and the results indicated that children with DS who also had CH were more likely to have CHDs, albeit not statistically significantly. This outcome is in line with a study conducted in a hospital by Calcaterra et al., which found a strong correlation between CH and the presence of any congenital defects in DS patients [23].

In order to develop a simple approach, the main objective of the current study was to identify the range of diseases in the DS community. Prioritizing knowledge of DS at the primary healthcare level will enable a timely transfer or referral to a secondary or tertiary level. Consideration should be given to the suggestion that secondary and tertiary hospitals include a thyroid screening procedure in their local neonatal and pediatric clinical guidelines.

Limitations

There were various restrictions on the investigation. Because it was a cross-sectional study with a limited population, the data was not always comprehensive. Additionally, some patients did not have repeat TFTs because they were lost to follow-up. Additionally, there was no control group in the study.

CONCLUSION

According to our research, a significant portion of kids with Down syndrome also have hypothyroidism. Therefore, for an early diagnosis, a thyroid profile should be performed on each child with Down syndrome, and appropriate hormone replacement treatment should be used to treat thyroid dysfunction. Annual thyroid profile follow-up is necessary to track changes in the patient's age and response to medication.

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