

Prevalence of Overweight and Obesity in School Children and their Correlation with Hypothyroidism in District Rohtas, Bihar

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Abstract

Introduction: Overweight and Obesity is a global health issue and it's incidence is rising consistently. It is developing as the most important contributor to ill health and mortality and is influencing adults as well as children and adolescents.

Aim and Objective: To study the prevalence of overweight and obesity in school children and their correlation with hypothyroidism in the District of Rohtas, Bihar, India.

Methodology: The study was concerned with the primary and middle school-going children of Rohtas district. total of 7 schools were selected, Weight was recorded using an electronic weighing scale, to the nearest 100 g. Height was recorded using the stadiometer to the nearest 0.1 cm.

Result: The total 10 (62.5%) of obese included in this study were hypothyroid out of 16 obese children and the total 6 (37.5%) obese were euthyroid. All the normal controls included were euthyroid. Although all the overweight children and control were euthyroid but mean value of TSH was comparability higher in overweight children than control, the difference was statistically significant (p value = 0.002). The mean levels of T4 were higher in overweight children than controls but was statistically not significant.

Conclusion: There is a rising prevalence of overweight and obesity in India, leading to altered TSH and fT4 levels. The mean levels of TSH were significantly higher in obese children than controls. The mean levels of T4 were significantly lower in obese children than controls.

Keywords: Overweight; Obesity, BMI, TSH, Euthyroid.

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Introduction

Overweight and Obesity is a major health issue. It's incidence is increasing everywhere throughout the world.[1] Obesity is a type of malnutrition that is rising among all age and socio-economic groups. [2,3]

Being Overweight, Obesity, malnutrition and infectious diseases are become the most

common nutritional issues worldwide. It is developing as the most important contributor to morbidity and mortality and is influencing adults as well as children and adolescents [4] it is evaluated that one out of ten of the world's school-going children are carrying excess body fat.[5] Obesity has begun infiltrating

health problem to the underdeveloped and developing nations, also including India. As compiled by WHO incidence of childhood obesity is over 2% in many developing countries. India is considered to be among the top four countries affected by obesity by 2025.

Therefore, it has a high potential for the issue of childhood obesity. Some studies have demonstrated that 50-80% of obese children will continue as obese adults.[6]

Besides, obesity particularly central obesity is related to numerous endocrine abnormalities, including thyroid dysfunction. T3 manages energy metabolism and thermogenesis and plays an important role in glucose and lipid metabolism, food intake, and the oxidation of fatty acids.[7,8]

Thyroid hormones have a significant role in energy metabolism and ATP turnover, particularly in inducing thermogenesis by stimulating energy uncoupling protein (UCP). This can partially explain the commonly proposed mechanism that the increase in TSH and T3 in obese children is an adaptive process to increase energy expenditure and minimize further weight gain.

Obesity may incite a condition of resistance alike a genetic form of thyroid hormone resistance. The changes in thyroid hormone receptors (TR) are seen in the adipose tissue but at the same time are available in other tissues.[9] Thyroid function tests are still now one of the most commonly performed laboratory analyses in this population.[10] A relative pituitary resistance to T3 bringing about increased concentrations of both TSH and T3 is also observed in obesity. The decreased tissue responsiveness clarifies the usual findings of increased TSH and T3 in an attempt to overcome peripheral resistance.[11]

Thyroid Hormone deficiency is the easiest

among all hormone substitution treatments. The drug of choice is levothyroxine (L-T4 sodium salt), which allows measuring serum T4 levels to assess the efficacy of treatment and modifying doses. Levothyroxine has a mean life.

of 7 days, and the maximum response is reached in the second week of treatment when a great part of T3 will have been converted.

Studies have not been directed around there regarding the prevalence of Overweight and Obesity in school children and their correlation with Hypothyroidism. Hence this study was conducted as the published literature is insufficient regarding the prevalence of overweight and obesity in school-going children from Bihar. The present study was conducted to study the prevalence of overweight and obesity in school-going children and their correlation with hypothyroidism in the district of Rohtas, Bihar.

Aims

- Study the prevalence of overweight and obesity in school children in the District of Rohtas, Bihar, India.
- Correlation of obesity and overweight with hypothyroidism

Objectives

1. To know the prevalence of overweight and obesity in school children of District Rohtas, Bihar, India
2. To find Correlation between Thyroid function and Overweight & Obesity.

Material and Methods

Place of study: Narayan Medical College and Hospital, (NMCH) Jamuhar, District-Rohtas

Study population: Primary and middle school-going children in 3 subdivisions of Rohtas district namely Sasaram, Bikramganj,

and Dehri-On-Sone. Government and private schools were randomly selected in each sub-division. Total of 7 schools were selected.

Inclusion criteria:

School going children between 6-12 years of age in governments and private schools (total 7 schools)

Exclusion criteria:

1. Diagnosed case of thyroid disease, metabolic syndrome, and any others endocrinal disorders.
2. Any patient with chronic liver disease, chronic kidney disease (CKD)
3. Patient taking drugs that alter serum TSH levels (Glucocorticoids, Iodine, Growth hormone, Amiodarone).
4. Children outside Rohtas district.

Weight of the children was recorded by an

electronic weighing scale, to the nearest 100 g. Height was recorded by the stadiometer to the nearest 0.1cm. Thyroid function study was performed in Department of biochemistry, NMCH, Jamuhar. Levels of serum TSH and free T4 levels were done by the Enzyme-linked Fluorescence assay (ELFA) method with a fully automated immunoassay system (VIDAS).

Statistical Analysis

All relevant data were analyzed by the statistical package for social science version 21.0 (SPSS, Chicago, IL, USA). Continuous variables were expressed as mean \pm standard deviation (SD) and categorical variables as count and percentage. Comparisons between groups were performed using Student's t-test for continuous variables and the chi-square test for categorical variables. The correlation between BMI and thyroid function test was evaluated using Pearson's correlation.

Result

Table 1: Distribution of participants according to Body mass index (BMI)

Parameter (BMI)	Number (1374)	Percentage
Underweight (<5 th centile)	390	28.38%
Normal (5 th to 84 th centile)	918	66.81%
Overweight (85 th to 94 th centile)	50	3.63%
Obese (> 95 th centile)	16	1.16%
Total	1374	100%

Table 1: Shows distribution of participants according to Body mass index (BMI), 28.38% study subjects were underweight, 66.81% study subjects were having normal BMI, 3.63% study subjects were overweight whereas 1.16% study subjects were obese.

Table 2: Comparison of thyroid function status in overweight and controls

	Obese (n=16)		Overweight (n=50)		Control (n=50)	
	No of person	Percentage	Number of person	Percentage	Number of person	Percentage
Hypothyroid	10	62.5%	0	0%	0	0%
Euthyroid	6	37.5%	50	100%	50	100%

All the overweight and normal controls (100%) included were euthyroid. Of The total 10 (62.5%) of obese included in this study were hypothyroid 16 obese children and the total 6 (37.5%) obese were euthyroid

Table 3: Comparison of mean TSH and T4 in overweight children and controls

Thyroid hormone	Overweight (50)	Control (50)	P VALUE (sample independent t-test)
	MEAN±SD	MEAN±SD	
TSH (mcgIU/ml)	4.20±0.47	3.45±1.61	0.002
T4 (ng/ml)	119.64±23.22	111.52±19.75	0.18

Although all the overweight children and control were euthyroid the mean value of TSH was comparability higher in overweight children than control, the difference was statistically significant (p value = 0.002). The mean levels of T4 were higher in overweight children than controls but were statistically not significant.

Table 4: Comparison of mean TSH and T4 in obese children and controls

Thyroid hormone	Obese (16)	Control (16)	P VALUE (sample independent t test)
	MEAN±SD	MEAN±SD	
TSH (mcgIU/ml)	6.43±0.35	3.10±1.31	0.0001
T4 (ng/ml)	77.63±13.55	108.25±21.33	0.0041

The mean levels of TSH were significantly higher in obese children than in controls. The mean levels of T4 were significantly lower in obese children than in controls.

Table 5: Correlation between Thyroid function and BMI in overweight case.

Thyroid function	Overweight	Control	Mean BMI in overweight	R (co-relation coefficient)	P value (Pearson's correlation)
TSH (mcgIU/ml)	4.20±0.47	3.45±1.61	19.43±1.97	-0.116	0.42(non-significant)
T4 (ng/ml)	119.64±23.22	111.52±19.75	19.43±1.97	-0.2814	0.047(significant)

The correlation of BMI with TSH and T4 was evaluated using Pearson's correlation. TSH had a negative non-significant correlation with BMI and T4 had significant negative correlation with BMI.

Table 6: Correlation between thyroid function and BMI in obese case

Thyroidfunction	Obese	Control	R (co-relation coefficient)	P value (Pearson's correlation)
TSH (mcgIU/ml)	6.43±0.37	3.10±1.31	-0.2093	0.43 (non- significant)
T4 (ng/ml)	77.63±13.55	108.25±21.33	-0.1886	0.48 (non- significant)

The correlation of BMI with TSH and T4 was evaluated using Pearson's correlation. TSH had negative non-significant correlation with BMI and T4 had non-significant negative correlation with BMI.

Discussion

In recent years, there is increasing concern about overweight and obesity in school going children due to changes in lifestyle and

dietary habits. The present study to find the prevalence of overweight and obesity in school children and their correlation with

hypothyroidism in the District of Rohtas, Bihar, India. The present prospective cross-sectional study was conducted from May 2019 to April 2020 for 1 year at NMCH, Jamuhar, Rohtas, Bihar. We randomly selected a total of 7 schools both government schools and private schools in each subdivision. A Total of 1374, Children between 6-12 years of these 7 schools participated in the study.

In this present study 28.38% study subjects were underweight, 66.81% study subjects were having normal BMI, 3.63% study subjects were overweight whereas 1.16% study subjects were obese. Study by Kalpana CA *et al* [2] observed overall prevalence of overweight and obesity in 35 schools of Coimbatore to be 7.6 % and 5.6% respectively. Styne DM *et al* [4] showed that the prevalence in children with a BMI of more than the 85th percentile is 22%, and that of children with a BMI of more than the 95th percentile is 10.9%, for children aged 6 to 17 years in all ethnic groups.

In our study, the correlation of BMI with TSH and fT4 was evaluated using Pearson's correlation. TSH had negative non-significant correlation with BMI and T4 had significant negative correlation with BMI in overweight case while TSH had negative non-significant correlation with BMI and T4 had non-significant negative correlation with BMI in obese case. This result was in match with Kumar KVH *et al* [12] and Aeberli I *et al* [13]. On the other hand, it was in contrast Grandone A *et al* [14] and Marras V *et al* [15]

This correlation might suggest an association with leptin, which is regulated by body adiposity. there is a synchronicity between the secretion of leptin and TSH. There is a report demonstrate that TSH is related both BMI and leptin in obese and anorexic patients. considering that TSH production is regulated by several transmitters and hormones which regulates body weight and satiation, such as

neuropeptide Y, alpha-melanocyte-stimulating hormone, and leptin itself. For example, a tissue-specific modulation of deiodinases at the pituitary level might be implicated in the effect of leptin on thyroid function.[13]

fT4 had a significant negative correlation with BMI which means a decrease in levels of fT4 will lead to an increase in BMI. Solanki A *et al* [16] found that BMI had negatively associated with serum fT4. Moreover, Roos A *et al* [17] reported that serum fT4 had negatively associated with BMI. Also, Iacobellis G *et al* [18] reported that, in morbidly obese women, lower fT4 values were accompanied by higher BMI values.

Fontenelle LC *et al* [19], Niranjana U and Wright NP [20] observed a high prevalence of thyroid dysfunction among obese patients, especially among extremely obese. This suggests that appropriate monitoring of thyroid function may be recommended among obese patients. Brienza C *et al* [21] Wang X *et al* [22] in their studies also suggested that obese patients with hypothyroidism had much poorer outcomes than those without thyroid dysfunction. Some of the Recent studies suggest that obesity might increase the risk of autoimmune diseases, such as psoriatic arthritis and rheumatoid arthritis, suggesting main role of obesity and adipocytes in the development of autoimmunity.

Rotondi M *et al* [23] found that obese patients should be diagnosed as having subclinical hypothyroidism based only on their elevated serum TSH levels. It suggests that elevated serum TSH may not be enough for diagnosing subclinical hypothyroidism in obese patients. Thus, it is recommended that circulating thyroid antibodies should be measured in obese patients to further support a diagnosis of autoimmune thyroid disease.

A total of 50 children of similar age and sex

with normal BMI were taken as controls and their TSH and fT4 levels were compared with overweight children it was found that the mean levels of TSH were significantly higher in overweight children than controls. The mean levels of fT4 were significantly higher in overweight children than controls.

A total of 16 children of similar age and sex with normal BMI were taken as controls and their TSH and fT4 levels were compared with obese children it was found that all the overweight and normal controls included were euthyroid. 62.5% of obese included in this study were hypothyroid and 6% of obese were euthyroid. All the normal controls included were euthyroid. The mean levels of TSH were significantly higher in overweight children than controls. The mean levels of T4 were higher in overweight children than controls but the difference was not significant. The mean levels of TSH were significantly higher in obese children than controls. The mean levels of T4 were significantly lower in obese children than in controls.

Conclusions

In this study we have observed that overall, the prevalence of Overweight among school going children was 3.63%, while the prevalence of obesity among school going children in the district of Rohtas, Bihar was 1.16% of study. Only 10 (0.73%) study subjects were hypothyroid, rest were euthyroid. All of these 10 hypothyroid subjects were from obese group. The mean levels of TSH were significantly higher in obese children than controls. The mean levels of T4 were significantly lower in obese children than controls.

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