

**A COHORT STUDY OF THYROID HORMONE IN PEDIATRICS: CORRELATION WITH OBESITY IN SAUDI ARABIA**

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Article Received on 18/11/2021

Article Revised on 08/12/2021

Article Accepted on 28/12/2021

**INTRODUCTION**

For children to grow or increase in height properly they need adequate levels of need growth hormone (GH) or somatotropin (Qiu H, 2017), and thyroid hormone also is essential for bones development in childhood and regulation in adulthood, and they both have many other effects, and growth hormone disorders can cause growth abnormalities weather it is excess production or decrees, the coloration between growth hormone and thyroid hormone is important because secretion and action of both hormones can be effected by each other (Cabello G, 1989), although thyroid stimulating hormone (TSH) is the main thyroid hormone regulator other factors can affect the thyroid hormone including growth hormone, also thyroid can affect growth hormone, increased levels growth hormone have been can lead to acromegaly, and patients of acromegaly can also develop goiter an from an enlarged thyroid gland (Cabello G, 1989), and patients who suffer from decreased levels of growth hormone and receive growth hormone replacement therapy can develop alterations in the hypothalamic-pituitary-thyroid axis, and can result in different changes wither it is a decrees in thyroxine (T4) levels or no changes, also triiodothyronine (T3) it can be in variable changes in can be increased or unchanged. (Glynn N, 2016). There is wide verity of possibilities that can be the cause of these and other possible changes, in this study we aim to understand growth hormone correlation with thyroid hormones in children who take growth hormone replacement therapy, and evaluate the entire hypothalamic-pituitary-thyroid axis, and the thyroid hormone function in this situation, and the potential effect of these interaction and the clinical results, and improve our understands of these situations to try and improve the treatment.

**KEYWORDS:** GHD = growth hormone deficient, SFH = security force hospital, KSA= Kingdom of Saudi Arabia.

**OBJECTIVE AND METHOD****Objective:**

A retrospective study of thyroid hormone and growth in Pediatrics Correlation effect of obesity in Security Forces Hospital, Riyadh. We assessed whether a resolved single event of growth hormone deficient in childhood was associated with obesity.

In order to measure the height and Wight of pediatric population who have growth delayed, before and after administer growth and thyroid hormone.

This research has been conducted at public military hospital at Saudi Arabi in Riyadh city in 2021.

**Methodology**

A retrospective study was done in which a convenience sample was assembled from security force hospital at

Riyadh. A total of 273 of growth hormone deficient (GHD) children with age range of 1 to 15 years old were investigated for their body weight and body height in the beginning of the study. On average, the children were enrolled in the study at 9 years old (SD = 2.64) and completed at 13 years old (SD = 2.52). This shows that on average, each child's height and weight were measured at 3.27 years of age (SD = 2.11). In the beginning of the study, the mean of body height was 124.51 cm (SD = 15.28) and recorded to reach 144.92 (SD = 14.52) at the end of the study. Similarly, the mean of body weight was 26.51 (SD = 10.76) at the end of study and show an increase to 41.80 (SD = 15.18) at the end of the study. These findings are summarized in Table 1. The distributions of height and weight at the beginning and the end of the study are also displayed in Figure 1.

## DISCUSSION

A retrospective study at turned into completed in which a convenience sample was assembled from security force hospital at Riyadh. a complete of 273 of growth hormone deficient (GHD) youngsters with age range of 1 to 15 years vintage were investigated for their frame of weight and height within the starting of the observe.

On common, the patients have been enrolled within the look at at 9 years old (SD = 2.64) and finished at 13 years old (SD = 2.52). This shows that on common, each child height and weight have been measured at 3.27 years of age (SD = 2.11). at the beginning of the observe, the imply of body height turned into 124.51 cm (SD = 15.28) and recorded to reach 144.92 (SD = 14.52) at the cease of the study. There's a strong relation between obesity and TSH.<sup>[1]</sup>

Most of the obese children showed a subnormal plasma GH reaction to GHRH and the imply plasma GH incorporated location (IC-GH) following stimulation changed into substantially smaller in overweight than on top of things children.<sup>[2]</sup>

Current evidence shows that leptin, that made of adipocyte-particular ob gene, exerts a stimulating impact on GH launch in rodents; need to the identical preserve proper in man, the coexistence of high leptin and low GH serum ranges in human obesity might fit in well with the concept of leptin resistance in this circumstance.<sup>[3]</sup>

In other studies, GHD were identified in obesity at 27.3% no matter the gender, also GH peak showed

negative correlation with BMI and age, and positive correlation with IGF-I.<sup>[4]</sup>

We found out, out of 273 patients, 258 (94.5%) received levothyroxine treatment and the relaxation 15 (5.5%) did not get hold of the remedy (control group). The growth rate is described as the annual rate of an increase in youngsters' weight and height.

The Levene's test has shown us that the independent t-test for comparing weight growth rate between males and females should be carried under the assumption of equal variances since the p-value is greater than 0.05 (F = 0.756, p = 0.278).

## RESULT

A total of 273 of growth hormone deficient (GHD) children with age range of 1 to 15 years old were investigated for their body weight and body height in the beginning of the study. On average, the children were enrolled in the study at 9 years old (SD = 2.64) and completed at 13 years old (SD = 2.52). This shows that on average, each child's height and weight were measured at 3.27 years of age (SD = 2.11). In the beginning of the study, the mean of body height was 124.51 cm (SD = 15.28) and recorded to reach 144.92 (SD = 14.52) at the end of the study. Similarly, the mean of body weight was 26.51 (SD = 10.76) at the end of study and show an increase to 41.80 (SD = 15.18) at the end of the study. These findings are summarize in Table 1. The distributions of height and weight at the beginning and the end of the study are also displayed in Figure 1.

**Table 1: Summary statistics.**

Variable	N	Mean	Std. Deviation	Minimum	Maximum	
Age (years)	Study start	273	9.76	2.64	1	15
	Study end	273	13.00	2.52	3	18
Study Duration	273	3.27	2.11	1	12	
Height (cm)	Study start	273	124.51	15.28	72.0	164.0
	Study end	273	144.92	14.52	92.5	169.7
Height increase	273	20.41	13.57	0.0	73.6	
Height growth rate	273	6.31	2.51	0.0	17.1	
Weight (kg)	Study start	273	26.51	10.76	8.26	80.8
	Study end	273	41.80	15.18	12	95.7
Weight increase	273	15.29	12.02	-6.15	77.0	
Weight growth rate	273	4.89	3.36	-1.54	28.75	

Figure 1: Boxplots for children's weight (left panel) and height (right panel) at the beginning and the end of the study.

Out of 273 patients, 258 (94.5%) received levothyroxine treatment and the rest 15 (5.5%) did not receive the

treatment (control group). In this study, we would like to investigate whether there is any significant different between the treatment and control groups in children's weight and height growth rate. The growth rate is defined as the annual rate to an increase of children's weight and height. This research hypothesis can be

formulated into the following null and alternative hypotheses:

H0: there is no significant different in the growth rate of weight (height) between treatment and control groups

H1: there is a significant different in the growth rate of weight (height) between treatment and control groups

An independent sample t-test is carried out to answer this hypothesis assuming that the two population of treatment and control groups have equal variances. This is confirmed from the Levene's test for testing equality of variance. The results indicate that the weight growth rate for treatment and control groups have equal variances since the p-value is not less than 0.05 ( $F = 1.436$ ,  $p = 0.232$ ). Similarly, the height growth rate for both groups also satisfy the assumption of equal variances since the p-value is not less than 0.05 ( $F = 0.024$ ,  $p = 0.877$ ).

Figure 2 shows that the growth rate for weight was higher among patients who received the treatment ( $M = 4.917$ ,  $SD = 3.430$ ) than those who did not receive the treatment ( $M = 4.440$ ,  $SD = 1.928$ ). However, the t-test

indicates that the mean difference between the two groups was not statistically significant since the p-value is greater than 0.05 ( $t(271) = 0.533$ ,  $p = 0.594$ ). This shows that there is no significant difference in weight gain between patients who were treated with growth hormone and those who were not (Table 2).

The growth rate for height was also higher among patients who received the treatment ( $M = 6.415$ ,  $SD = 2.484$ ) than those who did not receive the treatment ( $M = 4.547$ ,  $SD = 2.448$ ) as displayed in Figure 2. The t-test also confirms that the difference between the two groups was statistically significant since the p-value is less than 0.05 ( $t(271) = 2.833$ ,  $p = 0.005$ ). This shows that we have enough evident to conclude that the growth hormone treatment can increase height gain at higher rates than the control group (Table 2).

Figure 2: Plots of 95% confidence interval for growth rate of weight and height for treatment and control groups.

**Table 2: Results for independent t-test on weight and height growth rate between treatment and control group.**

Variable	Group	N	Mean	Std. Deviation	Mean Difference	t-test t-value	df	p-value
Weight growth rate	Control	15	4.440	1.928	0.477	0.533	271	0.594
	Treatment	258	4.917	3.430				
Height growth rate	Control	15	4.547	2.448	1.868	2.833	271	0.005
	Treatment	258	6.415	2.484				

An independent t-test is further carried out to see whether there is a significant different in growth rate among treatment group based on gender. Among treatment group, 125 (48%) patients were identified as males and 133 (52%) were females. Figure 3 shows that the males just have a slightly lower weight growth rate than the females. Meanwhile the growth rate for height is relatively higher among males than females. A formal test with the independent t-test can confirmed whether these differences between males and females in growth are significant or not.

Figure 3: Plots of 95% confidence interval for growth rate of weight and height for males and females patients who received the treatment

The Levene's test suggests that the independent t-test for comparing weight growth rate between males and females should be carried under the assumption of equal variances since the p-value is greater than 0.05 ( $F = 0.756$ ,  $p = 0.278$ ). The independent t-test as shown in Table 3 reveals that the mean difference in weight growth rate is not statistically significant since the p-value is greater than 0.05 ( $t(256) = -0.123$ ,  $p = 0.902$ ).

Thus we can conclude that the levothyroxine treatment increases weight gain at the same rate between males and females.

The Levene's test also suggests that the independent t-test for comparing height growth rate between males and females should be carried under the assumption of equal variances since the p-value is greater than 0.05 ( $F = 1.486$ ,  $p = 0.224$ ). The independent t-test as shown in Table 3 indicates that the mean difference in height growth rate is not statistically significant since the p-value is greater than 0.05 ( $t(256) = 0.688$ ,  $p = 0.492$ ). Thus we also conclude that the height gain for males and females increases at the same rate under the levothyroxine treatment.

**Table 3: Results for independent t-test on weight and height growth rate between males and female**

Variable	Gender	N	Mean	Std. Deviation	Mean Difference	t-test t- value	df	p-value
Weight growth rate	Males	125	4.890	3.901	-0.053	-0.123	256	0.902
	Females	133	4.943	2.936				
Height growth rate	Males	125	6.524	2.628	0.213	0.688	256	0.492
	Females	133	6.311	2.345				

**CONCLUSION**

In our results provide it shows that BMI and height are positively associated with levels of serum TSH and f T(3) but not fT(4) among euthyroid Pediatrics. Longitudinal studies are needed to define the temporality of these associations and their potential health implications.

**Conflict of interest statement:**

The authors have declared that no competing interests exist.

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