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Effect of exercise on thyroid stimulating hormone and body mass index level on obese adolescent boys

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Abstract

Obesity results in many endocrine abnormalities. The aim of the present research is to study the effect of exercise on thyroid stimulating hormone and body mass index level on obese adolescent boys. The present experimental study was conducted among 15 euthyroid obese children with higher normal TSH level in the age group of 14-16 years. After measuring the height and weight of the samples using standardized equipments, BMI was calculated by dividing weight (kg) by height square (meter square) and the obtained value was plotted on the age- and gender-specific Centers for Disease Control (CDC) BMI growth charts to obtain a percentile ranking. BMI percentiles were calculated using CDC charts for boys aged 2 to 20 years. Obesity was defined as a BMI $\geq 95^{\text{th}}$ percentile for age and gender. Overweight was defined as a BMI percentile of $\geq 85\%$ to $< 95\%$, and healthy weight as a BMI percentile of $\geq 5\%$ to $< 85\%$. Blood samples were collected and TSH levels were measured in a laboratory. Following baseline assessment, all selected subjects underwent a 12-weeks aerobic physical activity for 5 days a week. The programme started with warm up for 10 minutes followed by jogging carried out with 60% intensity for twenty minutes and ended with cool down exercise for 10 mts. BMI and TSH level were measured after six weeks work out. The results showed significant difference in BMI and TSH levels. Though there was difference in weight between pre and post test, it was found to be insignificant.

Keywords: Obesity, thyroid stimulating hormone, body mass index, exercise

Introduction

Globally, prevalence of obesity among children and adolescents are increasing at distressing levels. Overweight and obesity in children are found to be the most important risks to children health. Excess weight often start children on the path to health problems that were once considered adult problems such as diabetes, high cholesterol, and high blood pressure. Obese children may also become obese adults. The International Obesity Task Force and International Association for the Study of Obesity estimated that 200 million school children were either overweight or obese ^[1]. Though Lifestyle issues such as sedentary activity and intake of too many calories from food and drinks are the main contributors to childhood obesity, genetic and hormonal factors also play a vital role.

Thyroid Hormones and Weight

Thyroid hormones are required for the normal growth, development and function of all tissues, with major outcome on oxygen consumption and metabolic rate. Thyroid hormones regulate basal metabolism, thermogenesis and play an important role in lipid and glucose metabolism, food intake and fat oxidation ^[2]. Thyroid disorders can increase or decrease metabolism by disrupting the production of thyroid hormones. The thyroid stimulating hormone (TSH) is a master hormone which regulates the work of the thyroid gland. If TSH is high, it indicates that thyroid function is too low (hypothyroid). If TSH is low, then it means that the thyroid is overactive (hyperthyroid.) When hormone levels become too low or too high, individual may experience a wide range of symptoms. Weight gain may signal low levels of thyroid hormones, hypothyroidism. If unexplained weight loss occurs, especially with a good appetite, it might be due to hyperthyroidism. Thyroid hormone status correlates with body weight and energy expenditure ^[3]

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Benefits of Exercise

Physical activity influences energy metabolism in human subjects by increasing activity induced energy expenditure and resting metabolic rate and helps keep weight down. Regular exercise is an important part of overall strategy to manage many hypothyroidism symptoms. Aerobic exercise increases flow of blood in the body making heart beat faster and lungs to take in more oxygen. It helps keep their heart, lungs, and blood vessels healthy. Aerobic exercise includes any type of exercise that works large muscle groups for 20 minutes or more and keeps heart beating between 60-80% of maximum heart rate. Activities like jogging, swimming, running, jumping rope can keep heart rate up at a good steady pace for at least 30 minutes. Aerobic exercise can be done to lose weight and regain health. Childhood obesity is a sign of poor physical health, mental disorders, respiratory problems, metabolic syndrome and glucose intolerance, all of which can trail into adulthood This observational study was conducted to see the relation between weight, physical exercise and thyroid function.

Methodology

The present experimental study was conducted among 15 euthyroid obese children with higher normal TSH level in the age group of 14-16 years. Purpose of the study was explained and consent was obtained from the parents of the children who participated in this study. Weight was measured with the

subject wearing light clothing with bare feet using standardized weighing machine. Height was measured using a wall-mounted stadiometer. BMI was calculated by dividing weight (kg) by height square (meter square) and plotted on the age- and gender-specific Centers for Disease Control (CDC) BMI growth charts to obtain a percentile ranking. BMI percentiles were calculated using CDC charts for boys aged 2 to 20 years. Obesity was defined as a BMI $\geq 95^{\text{th}}$ percentile for age and gender. Overweight was defined as a BMI percentile of $\geq 85\%$ to $< 95\%$, and healthy weight as a BMI percentile of $\geq 5\%$ to $< 85\%$. Blood samples were collected and TSH levels were measured in a laboratory. Following baseline assessment, all selected subjects underwent a 12-weeks aerobic physical activity for 5 days/week. The programme started with warm up for 10 minutes followed by jogging carried out with 60% intensity for twenty minutes and ended with cool down exercise for 10 mts. BMI and TSH level were measured after six weeks work out. During the study period, subjects had regular diet with no specific diet recommendations and this was also considered as limitation for this study. None of the participant was undergoing pharmacological therapies nor had been previously treated with medications potentially interfering with thyroid function. The pre and post test results of TSH and BMI were analysed statistically.

Results

Table 1: The Means of Pre Test, Post Test and T Values of Selected Variables

Variables	Values measured in	Pre-Test Mean	Post- Test Mean	Standard Deviation	Df	Obtained T value
TSH Level	mU/liter	5.673	4.08	0.502	14	4.128*
BMI	Kg/M ²	27.17	24.36	1.824		7.598*
Weight	Kg	45.56	40.88	3.776		1.391
Height	Mts	1.294	1.295	0.021		0.4202

*Significant at 0.05 level of confidence

Table 1 shows the results of t test of selected variables. The pre and post test mean of TSH level were 5.673 and 4.08. The obtained T value for TSH level was 4.128. The pre and post test mean of BMI were 27.17 and 24.36. The obtained T value for BMI was 7.598. Both the TSH level and BMI t value were found to be significant since they were greater than the table

value 2.143. The pre and post test mean of Weight were 45.56 and 1.7. The obtained T value for weight was 1.391. The pre and post test mean of height were 1.294 and 1.295. The obtained T value for height was 0.420. Both the height and weight t value were found to be insignificant since they were lesser than the table value 2.143.

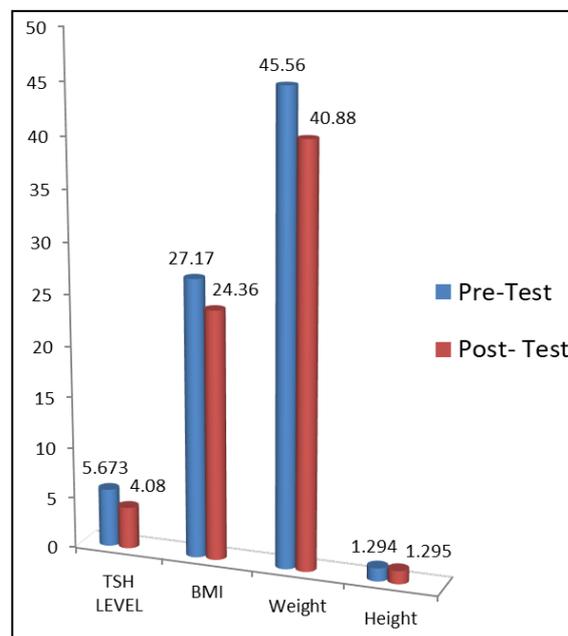


Fig 1: The Pre and Post test mean values of selected variables

Discussion

The results of the present study shows significant difference in BMI and TSH levels. Though there was difference in weight between pre and post test, it was found to be insignificant. Research at the University of Gaziantep in Turkey also conducted similar research to study the effects of exercise on levels of TSH. The results showed that medium-intensity aerobic exercise produced the best results for improving TSH. ^[4] Several studies have found changes in TSH in obesity with normal levels of T4 and T3. Physical activity prevents obesity in multiple ways ^[5].

Conclusion

Thyroid functions improve in hypothyroid individuals who are doing regular physical exercise. Regular physical activity helps to reduce weight and TSH level among obese individuals. Exercise burns calories to prevent weight gain and can boost up metabolism. Regular exercise acts an important role to manage many hypothyroidism symptoms.

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