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Evaluation of Effect of Zinc Administration and Exercise on Thyroid Hormone Level in Human Body

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Abstract

Background: Aim: To evaluate effect of zinc administration and exercise on thyroid hormone level in human body. **Subjects and Methods:** One hundred twenty healthy adults in age ranged 18-23 years of either gender were randomly assigned to either of 4 groups. Group I was sedentary groups given zinc, group II were given zinc only, group III were put on training only and group IV was sedentary group. The enzymatic calorimetric method was used for measurement of TSH, FT3 and FT4 levels. **Results:** The mean height in group I subjects was 176.2 cms, in group II was 176.4 cm, in group III was 176.9 cms and in group IV was 175.5 cms. Pre- test weight in group I was 76.5 kgs and post-test was 78.2 kgs, in group II was 75.8 kgs and 77.7 kgs, in group III was 76.4 kgs and 79.2 kgs and in group IV was 78.3 kgs and 77.6 kgs respectively. Pre- test and post- test TSH (uIU/mL) in group I was 2.54 and 2.43, in group II was 2.53 and 2.06, in group III was 2.62 and 2.10 and in group IV was 2.75 and 2.78 respectively. FT3 (pg/mL) level in group I was 3.77 and 3.56, in group II was 3.82 and 3.68, in group III was 3.75 and 3.50 and in group IV was 3.85 and 3.77 respectively. FT4 (ng/dL) level was 1.57 and 1.46 in group I, 1.56 and 1.34 in group II, 1.50 and 1.32 in group III and 1.52 and 1.54 in group IV. **Conclusion:** Zinc supplement and exercise can lead to the alteration of thyroid level in athletics.

Keywords: Exercise, thyroid level, Zinc supplement.

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Introduction

A healthy body demands various trace metals such as iron, zinc etc. Zinc is found second to iron in quantity in human body. It is about 2-3 grams in a healthy normal weight (70 kg) men.[1] Most common function of zinc is production of free radicals, organizing immune system and impulse transmission along nerves. It is considered as one of the stress scavenger. It has role in stabilizing cell membrane, expression of genes, stimulation of cells.[2] Hence it is regarded as a trace element maintaining biological processes. It is necessary for production of adequate power during physical activity such as in weight lifting, heavy training, in athletics etc.[3]

Thyroid hormones such as thyroxine and tri-iodothyronine are produced by thyroid gland. Normal body functions, thyroid hormones, should be produced in adequate amount.[4] It helps in maintaining basal metabolic rate (BMR) and consumption of oxygen. Its level increases significantly during exercises. It also affects growth of body, synthesis of protein, metabolism of lipids etc.[5] It acts synergistically with other hormones such as sex hormone, prolactin, thyroid hormone and growth hormone. Literature shows that a significant relation exists between thyroid hormone and zinc. The level of thyroid fluctuates with change in physical work.[6,7] Considering this present study was an attempt to evaluate effect of zinc administration and exercise on thyroid hormone level in human body.

Subjects and Methods

A sum total of one hundred twenty healthy adults in age ranged 18-23 years of either gender were part of the study. All participants agreed to this study was conducted following declaration of Helsinki.

All subjects were randomly assigned to either of 4 groups. Group I was sedentary groups given zinc, group II were given zinc only, group III were put on training only and group IV was sedentary group. Zinc was prescribed as 3 mg/kg/day for 6 weeks. For the assessment of T3, T4 and FT3, a venous sample of 3 cc was obtained which were centrifuged at 3000 rpm³ for 10 minutes and fractionation of blood plasma was done. The enzymatic calorimetric method was used for measurement of TSH, FT3 and FT4 levels. For assessment of level and for achieving statistical inference, appropriate tests were applied. Data was entered in MS excel sheet and analysis using SPSS version 19.0 was used. A significant p level was 0.05.

Results

Age group 18- 20 years had 8 males in group I, 7 i9n group II, 10 in group III and 8 in group IV and females were 6 in

group I, 5 in group II, 8 in group III and 7 in group IV. 21-23 years had 7 male and 9 female in group I, 9 male and 9 female in group II, 7 male and 5 female In group III and 6 male and 9 female in group IV [Table 1, Figure 1]

Table 1: Participants distribution as per age and gender

Age group (years)	Gender	Group I	Group II	Group III	Group IV
18- 20	Male	8	7	10	8
	Female	6	5	8	7
21-23	Male	7	9	7	6
	Female	9	9	5	9

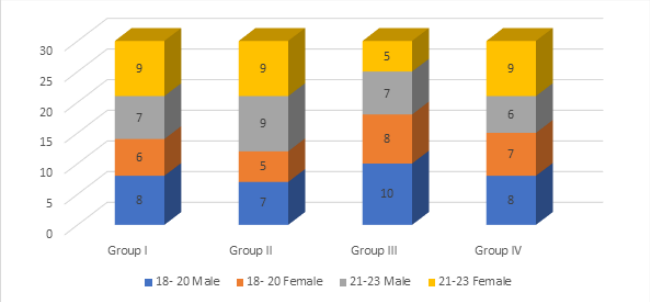
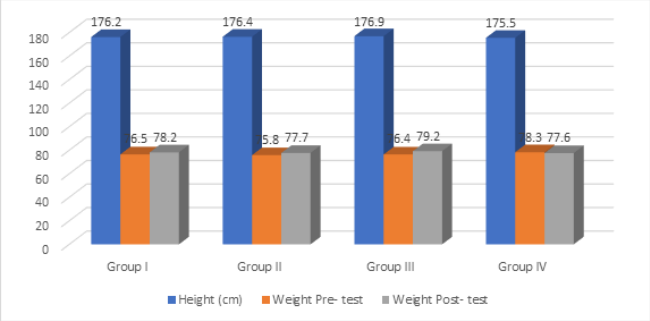


Table 2: Comparison of parameters

Parameters	Variables	Group I	Group II	Group III	Group IV	P value
Height (cm)		176.2	176.4	176.9	175.5	>0.05
Weight	Pre- test	76.5	75.8	76.4	78.3	<0.05
	Post- test	78.2	77.7	79.2	77.6	

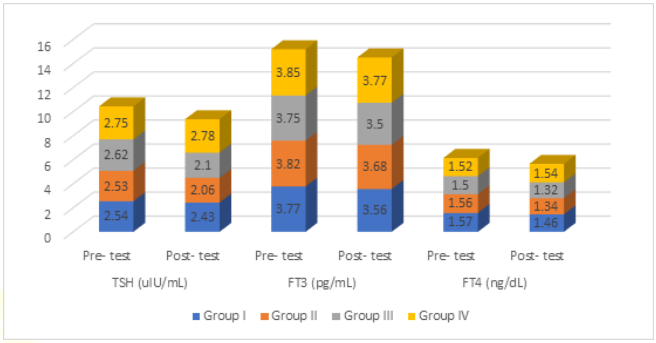
The mean height in group I subjects was 176.2 cms, in group II was 176.4 cm, in group III was 176.9 cms and in group IV was 175.5 cms. Pre- test weight in group I was 76.5 kgs and post- test was 78.2 kgs, in group II was 75.8 kgs and 77.7 kgs, in group III was 76.4 kgs and 79.2 kgs and in group IV was 78.3 kgs and 77.6 kgs respectively. A significant difference was seen (P< 0.05) [Table 2, Figure 2].



Pre- test and post- test TSH (uIU/mL) in group I was 2.54 and 2.43, in group II was 2.53 and 2.06, in group III was 2.62 and 2.10 and in group IV was 2.75 and 2.78 respectively. FT3 (pg/mL) level in group I was 3.77 and 3.56, in group II was 3.82 and 3.68, in group III was 3.75 and 3.50 and in group IV was 3.85 and 3.77 respectively. FT4 (ng/dL) level was 1.57 and 1.46 in group I, 1.56 and 1.34 in group II, 1.50 and 1.32 in group III and 1.52 and 1.54 in group IV [Table 3, Figure 3].

Table 3: Pre- test and post-test level of hormones

Parameters	Variables	Group I	Group II	Group III	Group IV	P value
TSH (uIU/mL)	Pre- test	2.54	2.53	2.62	2.75	<0.05
	Post- test	2.43	2.06	2.10	2.78	
FT3 (pg/mL)	Pre- test	3.77	3.82	3.75	3.85	<0.05
	Post- test	3.56	3.68	3.50	3.77	
FT4 (ng/dL)	Pre- test	1.57	1.56	1.50	1.52	<0.05
	Post- test	1.46	1.34	1.32	1.54	



Discussion

Zinc maintains appetite, immune system, reproductive system, vison and taste perception. It maintains nucleic acids and proteins levels.[8,9] Zinc role in maintaining physiological and biochemical systems is well established.10 Understressfull conditions, there has been mobilization of zinc from body reserves. The level of zinc alters during exercise.[11] Longer-duration exercise like distance running tend to have no immediate effect on plasma or serum zinc levels, but decreases have been observed in the hours after the activity.[12] Oh et al,[13] in their study on rats determined effects of exercise on plasma zinc concentrations and hepatic metallothionein and observed that after swimming the plasma zinc levels reduced with increased synthesis of hepatic metallothionein. We evaluated effect of zinc administration and exercise on thyroid hormone level in human body.

We observed that age group 18- 20 years had 8 males in group I, 7 in group II, 10 in group III and 8 in group IV and females were 6 in group I, 5 in group II, 8 in group III and 7 in group IV. 21-23 years had 7 male and 9 female in group I, 9 male and 9 female in group II, 7 male and 5 female in group III and 6 male and 9 female in group IV. Cinar et al,[14] included 40 men which were divided into 20 sedentaries and 20 who do physical exercises. Grouping was done as the sedentary control group, sedentary group only zinc (Z+S), training group with zinc (Z+T) and group with training only. It was seen that thyroid values of groups which were supplied with zinc decreased owing to the training and zinc supplement.

We observed that the mean height in group I subjects was 176.2 cms, in group II was 176.4 cm, in group III was 176.9

cms and in group IV was 175.5 cms. Pre- test weight in group I was 76.5 kgs and post- test was 78.2 kgs, in group II was 75.8 kgs and 77.7 kgs, in group III was 76.4 kgs and 79.2 kgs and in group IV was 78.3 kgs and 77.6 kgs respectively. Ciloglu et al,[15] have suggested that maximal aerobic exercises affect significantly the thyroid hormone levels.

We found that pre- test and post- test TSH (uIU/mL) in group I was 2.54 and 2.43, in group II was 2.53 and 2.06, in group III was 2.62 and 2.10 and in group IV was 2.75 and 2.78 respectively. FT3 (pg/mL) level in group I was 3.77 and 3.56, in group II was 3.82 and 3.68, in group III was 3.75 and 3.50 and in group IV was 3.85 and 3.77 respectively. FT4 (ng/dL) level was 1.57 and 1.46 in group I, 1.56 and 1.34 in group II, 1.50 and 1.32 in group III and 1.52 and 1.54 in group IV. Cakmakci et al,[16] on their study on effect of anaerobic exercises on athletic hormone levels found that the wingate test for anaerobic power increased the FT4 and tt levels of the football players and the thyroid stimulating hormone, FT4 and tt levels of the taekwon-do athletes.

Conclusion

Zinc supplement and exercise can lead to the alteration of thyroid level in athletics.

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