THYROID FUNCTION PROFILE IN APPARENTLY HEALTHY CHILDREN LIVING IN A SUB-URBAN COMMUNITY IN NIGERIA

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ABSTRACT: This study was carried out to assess the thyroid function profile in school children resident in Ekpoma, a sub-urban community in Nigeria and to explore the possible effect of weight, height, age and sex on thyroid function. Serum thyrotropin (TSH), triiodothyronine (T3) and total thyroxine (T4) levels were determined in 100 school children (39 males and 61 females) in the 11-15 years age group. This assessment was done between October and December 2009. Their samples were collected and analyzed using microwell ELISA technique. Results showed that the mean serum T3, T4 and TSH levels in the school children were 113.66±40.70 mg/dl, 9.87±2.73 ug/dl and 1.72±1.83 uIU/ml respectively. There was a non significant difference in serum T3, T4 and TSH levels in the school children evaluated when compared with standard reference range ($P>0.05$). The weight and height were not significantly correlated to `serum TSH and T3 levels ($P>0.05$). However, there was a significant negative correlation between the weight of the children and serum T4 levels ($r = -0.194$; $P<0.05$). Additionally, no statistically significant difference was observed between the male and female school children evaluated ($P>0.05$). Conclusively, variation in the serum thyroid profile was observed in school children but these changes were not significantly different from the standard reference range.

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Key Words: Thyroid Function, Reference Range and Microwell ELISA Technique

INTRODUCTION

Thyroid hormone controls the body's cell metabolism. When thyroid hormones are released into the blood stream, cells increase the rate at which they convert oxygen and nutrients into energy and heat for the body's use. During child's development, thyroid hormone stimulates an increase in growth rate. Release of thyroid hormones also stimulate mental activity and increase the activity of the other hormone producing glands (Sahni, 2008). Thyroxine and triiodothyronine are released into the blood stream in response to conditions such as stress, pregnancy and low level of thyroid hormone in the blood. This condition activates a hormone in the pituitary gland called thyroid stimulating hormones (TSH). TSH regulates the thyroid's production of hormones (Vanjonack et al., 1975). The thyroid gland produces another hormone, calcitonin, in response to high levels of calcium in the blood. Calcitonin causes the kidneys to discharge more calcium into the urine, this raises the amount of calcium stored in the bones (Guyton and Hall, 2006). Adequate supply of iodine is required for the synthesis of thyroid hormones. Based on this premise, a high incidence of goiter is often associated with geographical areas were soil content of iodine is low. However, this is now less so because commonly available salt is artificially iodized (Nduka, 1999). Control of energy expenditure is the primary function of thyroid hormones. In addition, they are indispensable for growth, development and sexual maturation in mammals. Other action includes stimulation of heart rate, heart contraction, stimulation of protein synthesis and carbohydrate metabolism, increase in the synthesis and degradation of cholesterol and triglyceride and increase in vitamin requirements (Burtis and Ashwood, 2003).

MATERIALS AND METHODS

Study Area

This study was conducted in Ekpoma, a semi-urban community in Edo State Nigeria. This community lies between longitude 05^0 04^0E and latitude 05^0 04^0N and 05^0 43^0N (CSSR, 2007) with an estimated population of over 61,870 inhabitants (National Population Census, 2007).

Study Subjects

A total of 100 apparently healthy school children between the ages of 12-16 years were recruited for this study from a secondary school in Ekpoma, after obtaining ethical permission from an ethical review board and appropriate informed consent from the subjects as well as their parents/guardian. The recruited participants were appropriately age and sex matched.

Sample Collection/Analysis

Blood samples (5mls) were collected by venepuncture into a plain container. The samples were spun in a bucket centrifuge at a speed of 2500rps to separate serum from red cells. The serum obtained was stored in a chest freezer at a temperature of -20^{0}C. Serum thyroid hormones (TSH, T3 and T4) were analyzed using microwell ELISA technique as described by (Walker, 1977; Burger and Palet, 1977; Ochei and Kolhatka, 2008).

Data Analysis

Data obtained was analyzed using SPSS version 17 statistical soft ware package. Results were expressed as mean±SD. Pearson's correlation coefficient analysis was also done and a P value of <0.05 was considered significant.

RESULTS

From the study, the mean age, weight and height of the participants in the study is 12.38±1.25 years, 43.89±8.42 kg and 1.42±0.21 meters respectively. As shown in Table 1, the mean serum T3, T4 and TSH levels is 113.66±40.70 mg/dl, 9.87±2.73 ug/dl and 1.72±1.83 uIU/ml respectively. This however, was not significantly different from the standard reference range. There was no significant sex dependent variation in thyroid function profile (Table 2) among male and female participants (P>0.05). There was a significant negative correlation between serum T4 levels and the weight of the participants (r = -0.194; P<0.05) and a significant positive correlation between the TSH levels and the age of the participants (r = 0.123; P<0.05).

Table 1: Thyroid Function Profile in Study Participants

Parameters	Test Group, N=100	Reference Range
T3 (mg/dl)	113.66±40.70	140.00±84.85
T4 (ug/dl)	9.87±2.73	9.00±4.95
TSH (uIU/ml)	1.72±1.83	2.75±3.18

Values are expressed as mean ± SD; P<0.05 is considered significant when compared to reference range as provided by Ochei and Kolhatka, (2008).

Table 2: Sex Dependent Thyroid Function Profile in Study Participants

Parameters	Females, N=61	Males, N = 39
T3 (mg/dl)	116.74±48.25	108.85±23.96
T4 (ug/dl)	9.89±2.97	9.85±2.34
TSH uIU/ml	1.54±1.86	1.99±2.33

Values are expressed as mean ± SD; P<0.05 is considered significant

Table 3: Sex Related Distribution of Anthropometric Indices in Study Participants

Parameters	Females, N=61	Males, N=39
Age (years)	12.25±1.08	12.25±1.46
Height (m)	1.41±0.19	1.43±0.23
Weight (kg)	44.52±8.44	42.90±8.38

Values are expressed as mean ± SD; P<0.05 is considered significant

Table 4: Pearson's Correlation Analysis of Anthropometric Indices and Thyroid Hormones in Study Participants

Parameters	Age (years), N= 100	Height (m), N= 100	Weight (kg), N= 100
T3 (mg/dl)	-0.008	0.058	-0.065
T4 (ug/dl)	-0.055	-0.081	-0.194*
TSH (uIU/ml)	0.123*	-0.025	0.011

Correlation coefficient at P<0.05 is considered significant

DISCUSSION

The study showed that there was no significant alteration in serum T3, T4 and TSH levels in children when compared to control. This may be due to the increased availability of iodized table salts as suggested by (Nduka, 1999). In addition, the thyroid hormone profile in male and female participants was not significantly different. This suggests that thyroid function profile is not sex dependent. However, this finding is in discordance with the findings of Kaloumenou et al., (2010) who reported that female children have a lower TSH, T4 and T3 value when compared to their male counterpart. Our study revealed a negative correlation between serum T3 level and age; this however, was not significant. This finding is in agreement with the study of Mariotti et al., (1993) and Verheecke, (1997) which revealed a decline in serum T3 levels with an increase in age. Serum T3 levels positively correlated with the height's of study participants which is supported by the findings of Ronald et al., (2006) who revealed that excessive skeletal growth often occur in hyperthyroid children causing the child to be considerably taller at an earlier age. There was also a positive correlation between TSH levels and the age of the participants which was statistically significant. However, our study is in agreement with the study of Davey, (1997) which revealed an insignificant alteration in serum T4 levels with advancing age.

CONCLUSION

Conclusively, the serum thyroid profile in the suburban community under survey is quite satisfactory, considering the fact that it falls within the normal reference range. This is hinged to the success of the Nigerian health policy which promotes the sale and consumption of iodized salts.

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