

Thyroid hormones profile in students of College of Medical Radiological Science, Sudan University of Science and Technology, Khartoum ,Sudan

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Abstract

This study aimed to determine the thyroid hormones profile of students of the Sudan University of Science and Technology, College of Medical Radiological Science in Khartoum, Sudan during the period from 01/01/2013 up to 31/12/ 2013 using Radio- immunoassay (RIA). A cross sectional descriptive study was done involving 40 healthy students with the mean age of 21.79 years with a range of 19-29 years . Serum levels of thyroxine (T4), triiodothyronine (T3) were measured using Radio- immunoassay (RIA) and thyroid-stimulating hormone (TSH), TSH was assayed using Immunoradiometric Assay (IRMA). Subjects who volunteered to participate in the study were interviewed; their height and body weight measured, 5 ml of blood withdrawn, and sera harvested. The results showed that the reference range of thyroid related hormones level (mean \pm 2SD) was found to be as follows: T3 =1.38 \pm 2 (0. 5) n mole/L, T4 = 132.5 \pm (44.0) nmol/L and TSH= (mean \pm SD) 1.20 \pm 0.82 mU/L .In conclusion, the thyroid hormone concentrations obtained in this study was in the lower range of the values reported in previous studies. a local reference of thyroid hormone concentrations was established.

Key words: Thyroid ,Nuclear Medicine, Radio- immunoassay (RIA) , Sudanese, Serum levels of thyroxine (T4), Triiodothyronine (T3) were measured using Radio- immunoassay (RIA) ,Thyroid-stimulating hormone (TSH)

Introduction

In the Sudan, the period from the early 1980s to the mid 1990s witnessed substantial activity in connection with iodine deficiency disorders (IDDs) in the form of epidemiological and aetiological studies and assessments of the effects of different interventions.(Elnour,2000). The total prevalence of goitre reported in those studies ranged from 13% in the eastern city of Port Sudan and 17% in Khartoum state, to 78% in the central region and 87% in Darfur, in the west. According to a national study conducted in 1997, the overall prevalence of all types of goitre was 22% and prevalence figures ranged from 5% in the city of Khartoum to 42% in the Upper Nile region. It has been estimated that every year more than 200 000 children born in the Sudan are at risk of iodine deficiency(Bani, 2007)and that 3% of those children may develop cretinism, while 10% may experience severe intellectual impairment and 87% less severe intellectual disability.

Environmental and nutritional factors as well as factors which could affect the volume and the levels of thyroid hormones. It looks that among Africans there is a general trend towards' higher values in many analyses including hormones. From what is mentioned above concerning the size of the problem in Sudan and the absence of a local reference ranges. There is a need to determine of a true normal range for each of the thyroid related hormones (T3, T4and TSH)

As a result, the World Health Organization (WHO) and the International Council for the Control of Iodine Deficiency Disorders (ICCIDD) now consider sonography the diagnostic method for assessment of goiter (WHO/NUT94)

The endocrine system and particular endocrine organs, including the thyroid gland, undergo – similarly to other organ systems – crucial functional changes with aging. Numerous morphological and physiological changes of the thyroid during the process of aging are well-known ((Lewiński et al , 2006),(Faggiano et al , 2011),(Papaleontiou& Haymart , 2012)

Importantly, subclinical disturbances of thyroid function are more frequent than overt diseases in general population, as well as in elderly people ((Cooper , 2004,Surks et al, 2004)

Consistently, the prevalence of subclinical hypothyroidism, which is characterized by normal free thyroxine (FT4) and elevated thyrotropin (TSH) levels, increases with aging (Ochs et al , 2008,Atzmon et al, 2009,Boucai& Surks , 2009,Surks & Boucai , 2010,Bremner et al , 2012,Cooper & Biondi , 2012,Yeap ,2012). and ranges from 3 to 16% in individuals aged 60 years and older (Biondi & Cooper ,2008) .Several changes in thyroid function and thyroid function tests occur with advancing age, as reviewed by Adler & Burman , 2007) Studies on the natural course of thyroid function tests in the elderly are often complicated by confounding factors such as the increased prevalence of autoimmune subclinical hypothyroidism, of chronic (non-thyroidal) illness and of medication induced changes in thyroid function tests.(van den Beld et al, 2005)The current study aimed to establish a local reference range of thyroid related hormones using Radio-immunoassay (RIA) in healthy adults Sudanese volunteers.

Materials and Methods

This study was done in Sudan University of Science and Technology, College of Medical Radiological Science during the period from 01/01 /2013 up to31/12/ 2013, A total of 40 healthy students from Sudan University of Science and Technology, College of Medical Radiologic Sciences were involved in this study. Thyroid related hormones(T4, T3, TSH) were measured using RIA technique

Exclusion criteria:

Subjects with anterior neck swelling or clinical evidence of thyroid disease were excluded Furthermore, women during menstruation, pregnant, women who have delivered within the last 12 months, were excluded from the study because this may affect the thyroid hormones. The data was collected and analyzed using SPSS for windows version 16

RIA technique:

Blood Samples: Five ml of venous blood collected in dry tubes allowed to clot and immediately centrifuged at 3000 r.p.m for 5 minutes and separated sera were stored at -20 C° until analyzed.

Specific Reagents: All radioimmunoassay specific reagents for the measurement of thyroid hormones were obtained from China Institute for Atomic Energy (CIAE), Department of Isotopes (Beijing China). The reagents include tracer, standard and antibodies and separating agents for the different hormones.

Principle of RIA: Antigen (Ag) and tracer (Ag*) compete with a limited amount of antibody (Ab) to form Ag-Ab or Ab-Ag*Complexes. This reaction radioactivity counted using gamma counter. Figures(1,2)

Statistical analysis:

Values were expressed as mean \pm standard deviation. normality of quantitative data was assessed using the 1-sample Kolmogorov-Smirnov test because the sample size is small to specify a normal range of serum thyroid values in the entire patient population. The statistical analysis was done using the Statistical Package for Social Sciences (SPSS) Version 17.0 (Table 2)

RESULTS:

The 40 subjects studied consist of 28(27.18 %) females and 75(72.82%) males (Table 1). The mean age of the subjects was 21.79 years with a range of 19-29 years. The assay results for T3 ,T4,&TSH were assessed in order to calculate the normal range for these hormones, the distribution is checked and subjects were found to be evenly (normally) distributed about the mean (Fig(3,4,and5 3) and (Table 2). The mean for T3 was found to be; 1.38 nmol/l and the SD was found to be 0.25, the mean of T4 (132.5) nmol/l, (21.9), the mean of TSH (1.2) Mu/l, the SD was (0.8) (Table 1).

DISCUSSION

Consequently marginal results for patients in a routine laboratory should be taken with great care of preferably repeated in a new sample in order to avoid misclassification resulting in such situations. A better solution for it would be by looking at the profile of both hormones or preferably if there is TSH to resolve the problem of marginal results (i.e., those in the overlapping area or extreme ends of the normal range curve). The study found that means value (mean \pm 2SD) for T3 =1.38 \pm 2(0.25) n mole/L, T4 = 132.5 \pm 2(21.97) nmol/l , and (mean \pm SD) for TSH= 1.20 \pm 0.8 mU/L. The values showed normal distribution by the one-sample Kolmogorov-Smirnov test (Table 2) ,By and large the lower limit of the normal range for both T3 and T4 was found to be lower than that reported in the literature. However, the upper limit for both hormones was found to be slightly lower than that reported in the literature (TSH=0.4-4.0 mU/L, Serum T3 level=0.3-3.0 n mole/L , Serum T4 level= 50-150 n mole/L) (Popova et al,2009,Ahmed et al, 2009 ,Yeo et al, 2011,Dika et al,2010 ,Alqahatani et al,2006,Sharp et al, 2005).

As Sudan is a large country continental in area, and as there are geographical variations in the normal range, it recommend that each region should establish its own normal range and do not depend on this report. This report can only be used safely in Khartoum laboratories. It can also be used as a reference document only for comparison by the remote laboratories.

In this study the true normal range for thyroid related hormones (T3, T4andTSH) in Sudanese is established updating to that reported by Nagi et al ,2000 . The important finding is that, the upper limit of the normal range for thyroid related hormones (T3, and TSH) was found to be lower than what is reported in the literature The upper limit of the T4 reference interval in our study is high compared to some other recent reports. This could be due to blood sampling in the mid day this observation must be taken with great care when interpreting patients' results in the future.

Thyroid related hormones levels in normal Sudanese subjects were reported. The selection of healthy persons according clinical combined with sonographic confirmation of a normal thyroid gland provide a valid basis for the reference interval for T3, T4, &TSH. Factors indicating a preclinical disease state, such as family history, pathologic ultrasonography result, can be associated with normal hormone concentrations.

Conclusion

In conclusion, the thyroid hormone concentrations obtained in this study was in the lower range of the values reported in previous studies. a local reference of thyroid hormone concentrations was established, It is recommended that each laboratory or hospital should establish its own reference values of T4, T3 and TSH for their clients because these hormones vary with ethnicity, geographical and climatic conditions of a population. ,also recommend BMI of patients to be taken into consideration during interpretation of serum TSH concentrations results. further studies are required to establish national references of thyroid hormone concentrations in Sudan

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Tables

Table (1) shows the means of participants demographic data

	N	Minimum	Maximum	Mean	Std. Deviation
Height (cm)	40	148.00	186.00	168.91	10.93
Weight (kg)	40	43.00	113.00	64.13	12.81
Age(year)	40	20.00	29.00	22.30	1.56

Table 2: show statistical analysis of thyroid related hormone using one-sample Kolmogorov-Smirnov test

		TSH	T3	T4
N		40	40	40
Normal Parameters ^a	Mean	1.20	1.38	132.500
	Std. Deviation	0.82	0.252	21.97
Most Extreme Differences	Absolute	0.15	0.19	0.17
	Positive	0.15	0.19	0.08
	Negative	-0.09-	-0.14-	-0.17-
Kolmogorov-Smirnov Z		0.96	1.25	1.08
Asymp. Sig. (2-tailed)		0.31	0.09	0.19

a. Test distribution is Normal.

Figures



Figure.(1) shows 125I Gamma Counting single channel



Figure.(2) shows kits ,tubes ,and racks

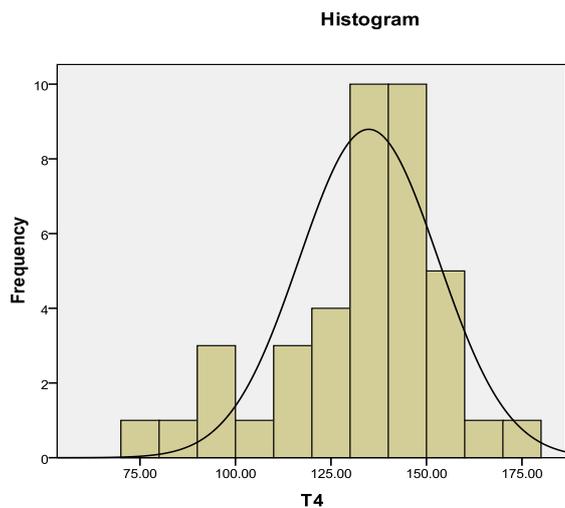


Figure (3) shows serum T4 concentration

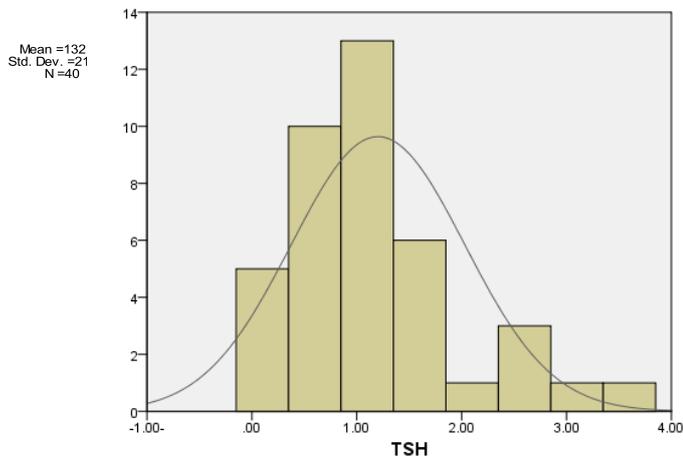


Figure (4) shows TSH serum concentrations

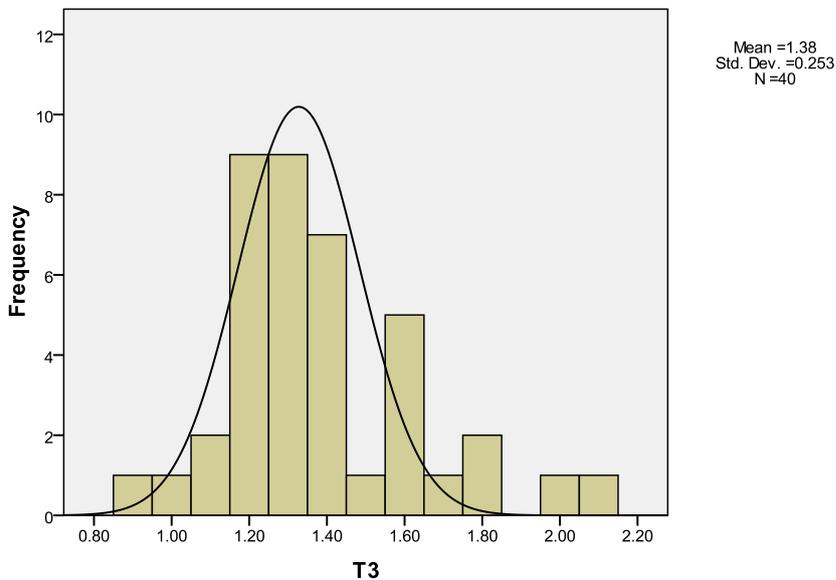


Figure (5) T3 serum concentration