THYROID HORMONES AND TSH IN NORMAL SUBJECTS

Pages with reference to book, From 51 To 54

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Abstract

Serum T4, 13, Free-T4, and TSH levels were estimated in 70 normal subjects (33 males and 37 females) using radioimmunoassay techniques. There was no significant difference in the levels of various hormones between the two sexes. The horñional, pattern of present series was quite similar when compared with other studies. Ihe results showed that the levels of various thyroid hormones and TSH were in some what middle of the ranges that were given in the radioimmunoassay kits for normal subjects.(JPMA 36: 51,1986).

INTRODUCTION

Diseases of thyroid gland are perhaps the commonest endocrine disorders. There is a very highincidence of goitre not only in the hffly areas of Pakistan but also in Karachi which is located by the side of the Arabian Sea.

There are no published studies about the normal thyroid hormone pattern in Pakistani population, hence we decided to study this in normal subjects to establish normal levels in both males and females.

MATERIAL AND METHODS

A total number of 70 apparently healthy subjects were studied. These included the attendents of patients, medical and paramedical staff of Jinnah Postgraduate Medical Centre, and medical students of Sind Medical College. There were 33 (47.14%) males and 37 (52.25%) females who belonged to different socioeconomic groups. Their ages ranged between 13-58 years and 14-56 years respectively. Serum thyroxine (T4), trilodothyronine (T3), free thyroxine (FT4), and thyrotropin (ISH) were measured by radioimmunoassay (RIA) techniques using RIA kits (supplied from Amersham International Ltd. U.K.) The free thyroxine index (FTI) was calculated from the T4 value and the T3 - uptake value to approximate the absolute free circulating concentration of thyroxine.

Blood was drawn usually in the morning and the serum was separated and stored at -20°C. Each assay was performed in duplicate serum samples. A set of quality control sera (Amersham U.K.) was also analysed with each assay to check the accuracy and performance of the assay. The radioactivity was counted by Miniassay type 6-20

Gamma counter. The results were further checked by coUnting the tubes in Multi detector computensed Gamma counter (model 1612 - Nuclear Enterprises) using 4 parameter non linear curve fitting model.

Statistical Analyses

Means and standard deviations, student “t” test, correlation and regression analysis of results were made. “p” values were calculated using Fisher and Yates statistical table. Chauvenets criterion was also applied to reject the readings which had a deviation from the mean greater than corresponding to the 1/2 n probability limit as these adversely affects the observed mean.

RESULTS

Of the total 70 subjects there were 33 males and 37 females. The mean age was 30.61 ± 1.7 years in

males and 24.16 ± 1.9 years in females. In 30 subjects (12 males and 18 females) the hormones were estimated by simple RIA kits and in 40 subjects (21 males and 19 females) by Amerlex RIA. The principle of the assay was similar, but the method was modified inAmerlex RIA and the normal ranges given in the kit were slightly different. The results were therefore analysed separately. The free thyroxine (Fr4) was estimated by Ameriex RIA only.

TABLE I

Thyroid Hormones and TSH in Normal Males and Females by Simple and Amerlex RIA.

Hormones	Simple RIA		Amerlex RIA	
	Males Mean ± S.E. (No)	Females Mean ± S.E. (No)	Males Mean ± S.E. (N0)	Females Mean ± S.E. (No)
T_4 (SIU)	119.43 ± 4.01 (12)	115.19 ± 4.1 (16)	103.61 ± 3.91 (21)	104.27 ± 3.55 (18)
T^3 (SIU)	2.39 ± 0.09 (12)	2.38 ± 0.136 (16)	1.70 ± 0.06 (20)	1.74 ± 0.11 (19)
TSH (SIU)	3.32 ± 0.48 (12)	4.34 ± 0.59 (18)	1.33 ± 0.14 (21)	2.15 ± 0.28 (16)
T_3-Uptake (%)	29.94 ± 0.9 (12)	28.20 ± 0.73 (16)	–	28.71 ± 0.97 (10)
FTI (SIU)	34.78 ± 0.82 (11)	32.52 ± 1.6 (16)	–	28.79 ± 1.88
FT_4 (SIU)	–	–	20.70 ± 0.47 (20)	18.38 ± 1.38 (16)
$T_3 : T_4$	1 : 51 (12)	1 : 51 (16)	1 : 61 (21)	1 : 66 (19)

Table I shows the mean (± S.E) of various hormones by simple and Amerlex RIA. No significant difference was noted in the mean levels between males and females.

TABLE II

The Range of Thyroid Hormones and TSH found in this Study and those given in RIA Kits for normal Subiects.

Simple RIA	T_4 (SIU)	T_3(SIU)	TSH (SIU)	T_3–Uptake (%)	FTI (SIU)	FT_4 (SIU)
Males	95.88–144.14	1.84–2.92	0.60–6.6	25.08–34.47	29.85–38.45	–
Females	90.09 – 146.72	1.31 – 3.23	1.52 – 6.9	20.00–33.14	23.55–45.93	–
(Kit Range)	(63 – 173)	(1.21 – 3.08)	(0 – 10)	(25.50–34.4)	(17.80–45.93)	–
Amerlex RIA	T_4 (SIU)	T_3 (SIU)	TSH (SIU)	T_3–Uptake (%)	FTI (SIU)	FT_4 (SIU)
Males	77.86–136.42	1.17–2.09	0 – 2.75	–	–	8.02–23.94
Females	83.60 – 134.23	1.09 – 2.46	0.39 – 4.2	22.36–33.4	19.27–36.7	10.29–28.7
(Kit Range)	(54 – 142)	(0.80–2.46)	(0–5.5)	(25.5–34.4)	(18.2 – 41.6)	8.8–23.0)

Table II shows the range of thyroid hormones and TSH found in subjects of this study and those given in the kit. No sex difference was noted. All hormonal ranges were found within the kits normal range except the range for T3 and Free-T4 (FT4) in females (Amerlex group) which were slightly elevated. As there was no significant difference in the two sexes (confirmed by student "t" test) the data was further analysed after combining the results of males and females in both simple and Amerlex RIA groups.

TABLE III

Mean (± S.E.) and Range of various Hormones in combined (Males+Females) Subjects and the Chau-Venets criterion.

Hormones	Simple RIA			Amerlex RIA		
	Mean ± S.E.	Range	Chau-venets criterion range	Mean ± S.E.	Range	Chau-vents criterion range
T_4 (SIU)	116.75 ± 2.92 (28)	90.09 – 146.72	80.80 – 152.7	104.71 ± 2.39 (39)	77.86–136.42	67.91–141.51
T_3 (SIU)	2.38±0.08 (28)	1.312–3.23	1.31–3.39	1.73±0.06 (39)	1.09–2.46	0.78–2.67
TSH (SIU)	3.93±0.31 (30)	0.6 – 6.90	0.06–7.92	1.68 ± 0.15 (37)	0 – 4.2	-0.5 – 4.48
T_3 –Uptake (%)	28.94±0.57 (28)	23.0 – 34.47	21.86–36.02	–	–	–
FTI (SIU)	33.80 ± 1.03 (28)	23.55 - 45.93	21.07 - 46.52	–	–	–
FT_4 (SIU)	–	–	–	18.88±0.82 (35)	10.29–23.94	7.77–29.99
T_3 : T_4	1 : 51 (28)	–	–	1 : 63 (39)	–	–

Table III shows the mean (±SE) and range of various hormones in combined (males and females) subjects by simple and Amerlex RIA. This table also shows the ranges obtained by Chau-venets criterion.
This criteria was applied to reject the grossly aberrent values which could have a marked effect on the mean value and resulting in a distorted standard deviation. It was found by this analysis that all hormonal ranges of this study were well fitted in the Chau-venets ranges and there was not a single extreme value in this data that could have a marked effect on the mean value, so there was no need to eliminate any value.
No significant correlation was noted between various hormones.

TABLE IV
Thyroid Hormones and TSH levels in N0rmal Subjects of other Studies.

Studies	T_4 (μg/dl)		T_3 (ng/dl)		TSH (μU/ml)		FT_4 (ng/dl)	
	Mean (No)	Range (No)	Mean (No)	Range (No)	Mean (No)	Range (No)	Mean (No)	Range (No)
Yamanaka[1] (Japan)	7.5 (SD 1.3) (61)	5.6 – 11.60 (61)	151.9 (SD 24.5) (61)	93–213 (61)	4.71 (SD 1.7) (23)	2.4–9.4 (23)	–	–
Melmed[2] (New york)	8.4 (SD 1.7) (22)	4.2–11.00 (22)	137.0 (SD 16.0) (22)	70–160 (22)	2.00 (SD 0.9) (22)	0.3 – 5.7 (22)	1.2 (SD 0.2) (22)	0.5 – 1.7 (22)
Schussler[3] (Newyork)	8.4 (SD 1.5) (31)	5.5–11.50 (31)	183.0 (SD 30.0) (31)	120–220 (31)	3.10(SD 1.2) (31)	<6.0 (31)	–	–
Vicenzo[4] (Newyork)	8.1 (SE 0.4) (31)	-	143.4 (SE 6.9) (31)	-	2.5 (SE 0.2) (31)	-	1.5 (SE 0.1) (31)	-
Borzio[5] (Italy)	7.3 (SE 0.2) (30)	–	140.0 (SE 6.9) (30)	–	2.4 (SE 0.1) (30)	–	0.99 (SE 0.3) (30)	
Gardner[6] (North Carolina)	–	5.0–12.0	–	70–159	–	<1.0-8.0	–	–
Walfish[7] (Canada)	–	5.0-12.0	–	80–220	–	< 2.0–6.0	–	–
Lambertz[8] (Switzerland)	–	4.9–12.0 (45)	–	78.228 (45)	–	–	–	0.7–1.8 (45)
Present series Simple RIA	9.07(SD1.18) (28)	6.7 – 11.42 (28)	154.0(SD 0.26) (28)	97 – 211 ~(28)	3.93 (SD 1.7) (30)	0.59 – 7.27 (30)	–	–
Amerlex RIA	8.13(SD 1.15) (39)	5.8 – 10.43 (39)	112.0 (SD 0.26) (39)	62–161 ~(39)	1.68 (SD 1.7) (37)	0.22–3.58 (37)	1.46(SD 0.37) (35)	0.72–2.2 (35)

Table IV shows some of the mean levels and ranges of thyroid hormones and TSH in Euthyroid subjects of other studies carried out in different parts of the world.

DISCUSSION

The present study was undertaken as a pilot study in order to determine the range of thyroid hormone and TSH in apparently healthy subjects. Results were compared with other reported series (Table IV). Slight variation in the mean and range between various studies is more likely due to the difference in techniques and the use of variable values as normal levels. Similar difference has been noted in the results of two RIA techniques used in this study.

The levels for serum T4,\ T3, Free T4 and TSH found in subjects of this study were quite similar with other reported series.[1,2,3,4,5] However, we have not encountered the T4 values below 5.8 pg/dl and T3 values above 2 11 4g/dl as seen in above reported series (Table IV). Mean Free-T4 levels was almost identical with the reported value of Vicenzo.[4] Maximum levels for serum TSH in two studies were 8.0 uU/ml[6] and 9.4 u.LU/ml' where as in three other studies2,3,7 (Table IV) values were below 6.0 uU/ml. In present series the upper limit of serum TSH was 7.27 #U/ml (simple RIA) and 3.58 uU/mi (Amerlex RIA).

It is concluded that, inspite of different ethnic background, the hormonal pattern in apparently healthy subjects from different parts of the world and in subjects studied at Karachi is nearly the same.

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