

Study of Thyroid Profile in Advancing Age

Ranjit Kaur Arora¹, Mary Pushpa Bara¹, Anil Kumar Kamal², Archana³, Pushplata⁴, Kumar Ashutosh⁴

ABSTRACT

Introduction: Thyroid hormone production, metabolism and action change with age. The incidence of thyroid dysfunction is increased greatly with age. It is not well documented whether mild thyroid dysfunction in the elderly causes clinical outcomes. This study has been carried out to compare the incidence of thyroid levels in the elderly and the young.

Material and Methods: The present study was conducted in the Department of Biochemistry, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India. The thyroid profile (free tri-iodothyroxine, free thyroxine and thyroid stimulating hormone) was analysed in 153 individuals not having any sign and symptoms or on any medication related to hypo or hyperthyroid.

Results: Thyroid profile was performed in the young and elderly male and female patients. Among 153 patients 100 were female and 53 were male. The mean age of the male subjects was 45.05 ±5.5 years whereas the mean age of females was 42.31±5.2 years. There is slight decrease in FT4 and slight increase in FT3 and TSH in females as compare to males but the differences were not significant. Thyroid profile in both men and women show a definite increase in TSH level and decrease in FT3 and FT4 level in elderly individuals as compare to young ones. All three changes were significant.

Conclusion: This study suggests that serum TSH levels increases with age, due to changes of normal aging.

Key words: Hypothyroidism, Hyperthyroidism, Euthyroidism.

INTRODUCTION

Thyroid hormone, thyroxine along with much lesser amount of tri-iodothyroxine is secreted by the thyroid gland under the influence of the hypophyseal thyrotropin releasing hormone and thyroid stimulating hormone of anterior pituitary.¹

Thyroxine is the main hormone of the thyroid gland and about 80 mcg of it is secreted per day. Thyroid secretes only 4 mcg per day of tri-iodothyroxine.²

Normally about 93% of the thyroid hormone released is thyroxine and approximately 7% of the thyroid hormone released is tri-iodothyroxine.³

Low T3 syndrome is a condition with impaired peripheral conversion of T4 to T3.⁴ Inappropriate secretion of thyroid hormones may occur in many thyroid disorders. In primary hypothyroidism T3 and T4 is suppressed while TSH concentration is high. While in primary hyperthyroidism T3 and T4 concentration is high while TSH is suppressed.⁵

Aging changes occur in all body systems including the endocrine system. These changes may be due to the decreased amount of hormones secreted or the decreased sensitivity of target organs.⁶ There has been long standing controversy about the thyroid function test results in the elderly.⁷

The levels of TSH, free T4 and free T3 hormone concentrations change with aging.⁸

In men the deficiency and excess of these hormones may cause decreased libido and impotence.⁹

In elderly individuals the non specific clinical manifestations of hypo and hyperthyroidism also cause confusion in the clinical setup. On the other hand the value of thyroid profile may move outside the normal ranges applicable to younger age group.¹⁰

In sub-clinical hyperthyroidism the levels of T3 and T4 hormones are normal but TSH is low.¹¹

Similarly high TSH with normal T3 and T4 hormones indicate hyperactivity of TSH as a result of defective negative feedback mechanism.^{12,13} Subclinical hypothyroidism is not associated with impaired physical functions or depression in individuals aged 65 years and older.

The larger and most recent NHANESIII survey showed that serum TSH concentration as well as serum thyroid peroxidase (TPoAb) and thyroglobulin (TgAb) antibodies rise with age in both men and women.¹⁴ In their study, the mean TSH increased and T4 decreased after the age of 20 in all ethnic groups, even after excluding thyroid antibody status and other risk factors. In a subsequent further analysis, Sucks and Hollowell examined the NHANESIII data which show progressive increase in mean, median and 97.5 percentile for TSH concentration with age in the disease free and reference populations. The analysis suggested that the 97.5 percentile is about 3.6 mIU/litre in people who are 20-39 years of age and 5.9 and 7.5 mIU/litre in those who are 70-79 and 80 years old and older, respectively.¹⁵

70% of older patients who would be classified as subclinical hypothyroidism with TSH greater than 4.5 mIU/litre were within their age-specific reference range.¹⁶

Serum T3 and FT4 levels were significantly lower in the older as compared with the younger subjects (1.27±0.27 vs 1.39±0.31 ng/mL and 0.97±0.29 vs 1.18±0.76 ng/dL, respectively).¹⁷ Serum levels of thyroid profile T3, T4 and TSH were determined in 127 elderly men, with 47 (37%) normal and 80 (63%) abnormal thyroid function. Average age of elderly men was 53.23 ±1.00 years. Forty seven normal young men with mean age of 28.6 ±0.02 years were taken as controls. When mean values of thyroid profile in normal elderly men were compared with the young ones, it showed increase in the level of TSH and decrease in T3 and T4 with age.¹⁸

MATERIAL AND METHODS

This study was conducted in the Department of Biochemistry, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India from August 2016 to March 2017 after obtaining approval

¹Associate Professor, ³Junior Resident, ⁴Tutor, Department of Physiology, ²Associate Professor, Department of Surgery, Rajendra Institute of Medical Sciences, Ranchi, Jharkhand, India

Corresponding author: Dr. Ranjit Kaur Arora, Associate Professor, Department of Physiology, RIMS, Ranchi-834009, Jharkhand, India

How to cite this article: Ranjit Kaur Arora, Mary Pushpa Bara, Anil Kumar Kamal, Archana, Pushplata, Kumar Ashutosh. Study of thyroid profile in advancing age. International Journal of Contemporary Medical Research 2017;4(5):1169-1171.

from Institutional Ethics Committee and written informed consent. The thyroid profile (free tri-iodothyroxine, free thyroxine and thyroid stimulating hormone) was analysed by chemiluminescent immunoassay method in 153 individuals not having any sign and symptoms or on any medication related to hypo or hyperthyroid. The levels of FT₃, FT₄ and TSH in elderly men and women compared with the young men and women. Reference values: FT₃ = 1.71-3.71 pg/ml; FT₄ = 0.70-1.48 ng/dl; TSH=0.35-4.90 μ IU/ml

The present study was carried out with aim to evaluate the thyroid profile of young and elderly age group of both sexes.

STATISTICAL ANALYSIS

Data were computer analyzed using MedCalc statistical package. Mean and standard deviation was calculated and 't' test was used to identify the significance of the relations.

The results were of statistical significance when the p-value was less than 0.05.

RESULTS

In our study thyroid profile was performed in the elderly male and female patients. Among 153 patients 100 were female and 53 were male. The mean age of the male patients was 45.05 \pm 5.5 years the mean age of females was 42.31 \pm 5.2 years. In males FT₃ level was 2.57 \pm 0.71 pg/ml, FT₄ was 1.01 \pm 0.24 ng/dl and TSH was 2.06 \pm 1.03 μ IU/ml that of females was FT₃ 2.62 \pm 0.60 pg/ml, FT₄ 0.93 \pm 0.18 ng/dl and TSH was 3.70 \pm 3.10 μ IU/ml. There is slight decrease in FT₄ and slight increase in FT₃ and TSH in females as compare to males but the differences were non significant (Table 1).

Out of 53 males 19 normal young men with mean age of 24.89 \pm 3.38 years, rest 34 were of elderly with mean age 56.32 \pm 8.55 years. The thyroid profile in young men was FT₃ 2.74 \pm 0.70 pg/ml, FT₄ 1.13 \pm 0.35 ng/dl and TSH 2.01 \pm 0.51 μ IU/ml and in elderly men FT₃ 2.62 \pm 0.58 ng/ml, FT₄ 0.94 \pm 0.11 ng/ml and TSH 4.22 \pm 0.95 μ IU/ml. FT₃ and FT₄ levels were lower

in elderly men but the difference of FT₃ was not significant (p = 0.505), FT₄ difference was significant (p= 0.0050) and TSH level was high in elderly men. The difference was highly significant (p= <0.0001) (Table 2).

In group of 100 females 50 were of young age with mean age of 24.86 \pm 3.50 years and elderly 50 females were with 53.75 \pm 7.92 years of mean age. Thyroid profile in 50 young females was FT₃ 2.74 \pm 0.56 pg/ml, FT₄ 1.04 \pm 0.19 ng/dl and TSH 2.06 \pm 1.03 μ IU/ml that in 50 elderly females was 2.54 \pm 0.62 ng/ml, FT₄ 0.92 \pm 0.14 ng/ml and TSH 5.33 \pm 3.60 μ IU/ml. The decrease in FT₃ and FT₄ were significant (p=0.0449 and 0.0005 respectively). The increase in TSH level in elderly group was highly significant (p=<0.0001) (Table 3).

DISCUSSION

In our study thyroid profile was performed in the elderly male and female patients. Among 153 patients 100 were female and 53 were male. The mean age of the male patients was 45.05 \pm 5.5 years the mean age of females was 42.31 \pm 5.2 years.

There is slight increase in FT₃ and TSH and decrease in FT₄ in females but these changes are not significant. The results were similar to some⁸ and according to others TSH increase was significant.¹⁵

Out of 53 males 19 normal young men with mean age of 24.89 \pm 3.38 years, rest 34 were of elderly with mean age 56.32 \pm 8.55 years.

This study shows the decrease in FT₃ and FT₄ in elderly men and rise in TSH level. Change in FT₃ level is non-significant, FT₄ level change is significant but TSH level change is highly significant. These similar results were observed by Md. Shoaib et al.¹⁸

In group of 100 females 50 were of young age with mean age of 24.86 \pm 3.50 years and elderly 50 females were with 53.75 \pm 7.92 years of mean age.

In this study there is decrease in FT₃ and FT₄ in elderly

Group	Number	Mean \pm SD			
		Age (years) (Mean)	FT ₃ (pg/ml)	FT ₄ (ng/dl)	TSH (μ IU/ml)
Male	53	45.05 \pm 5.5	2.57 \pm 0.71	1.01 \pm 0.24	3.43 \pm 1.34
Female	100	42.31 \pm 5.2	2.62 \pm 0.60	0.98 \pm 0.18	3.70 \pm 3.10
p value			0.6463*	0.3850*	0.5467*

* Not Significant

Table-1: Thyroid profile in males and females

Group	Number	Mean \pm SD			
		Age (years) (Mean)	FT ₃ (pg/ml)	FT ₄ (ng/dl)	TSH (μ IU/ml)
Normal young men	19	24.89 \pm 3.38	2.74 \pm 0.70	1.13 \pm 0.35	2.01 \pm 0.51
Normal elderly men	34	56.32 \pm 8.55	2.62 \pm 0.58	0.94 \pm 0.11	4.22 \pm 0.95
p value			0.505	0.0050	<0.0001

Table-2: Thyroid profile in young and elderly men

Group	Number	Mean \pm SD			
		Age (years) (Mean)	FT ₃ (pg/ml)	FT ₄ (ng/dl)	TSH (μ IU/ml)
Normal young women	50	24.86 \pm 3.50	2.74 \pm 0.56	1.04 \pm 0.19	2.06 \pm 1.03
Normal elderly women	50	53.76 \pm 7.92	2.50 \pm 0.62	0.92 \pm 0.14	5.33 \pm 3.60
p value			0.0449	0.0005	<0.0001

Table-3: Thyroid profile in young and elderly female

women and rise in TSH level. Decrease in FT3 and FT4 level is significant and TSH level increase is highly significant.

These results were similar to observed by Hesch RD⁸ and Koutras DA.¹¹

The observations of thyroid profile in both men and women show a definite increase in TSH level and decrease in FT3 and FT4 level in elderly individuals as compare to young ones. All three changes were significant. The similar findings were observed by Harman SM et al.¹⁷

CONCLUSION

This study suggests that serum TSH levels increase with age.

The process of aging is known to affect the entire endocrine system. The thyroid gland is also affected by aging. Thyroid disease symptoms in the elderly people are very similar to symptoms of the normal aging.

No clear benefit is seen in treating a high TSH in the elderly. As the TSH levels are altered with age, it would be wise to treat elderlies with Thyroid medication only on the basis of symptoms, and not on TSH levels alone.

This study is not large enough to conclude the normal range of thyroid profile in different age group and sex. A much larger study should be undertaken to set new parameters of normal ranges of hormone levels in the elder population.

REFERENCES

1. Genitile F, DiLano R and Salvalace G. Bio-synthesis and secretion of thyroid hormone. *Endocrinology* Vol. 1 (3rd edition) (Degroot LJ). W. B. Saunder's Co; Philadelphia 1995 pp 535.
2. Ganong's Review of Medical Physiology, 25th edition p.339.
3. Guyton and Hall. *Textbook of Medical Physiology*, 2nd edition p.594.
4. Kelly GS. Peripheral metabolism and thyroid hormones: a review. *Altern Med Rev*. 2000;5:306-33.
5. Maussier ML, D'Errico G, Putignano P, Reali F, Romano L, Satts MA. Thyrotoxicosis: clinical and laboratory assessment. *Rays*. 1999;24:263-72.
6. Mariotti S, Eranceschi A, Lossarizza, and Pinchera A. The aging thyroid. *Endocrine Review*. 1995;16:686-715.
7. Woeber KA. Aging and the thyroid. *The Western Journal of Medicine*. 1985;143:668-669.
8. Hesch RD, Gatz J and Pape. Total and free triiodothyronine and thyroid binding globulin concentration in elderly human persons. *European Journal of Clinical Investigation*. 1976;6:139-145.
9. Lenzen S and Baily CJ. Thyroid hormones gonadal and adrenocortical steroids and function of islat of Langerhans. *Endocrinol Rev*. 1984;5:411.
10. Seck T, Scheidt C, Zeigler R and Dfeilsclifer J. Prevalence of thyroid gland dysfunction in 50-80 years of old patients. An epidemiological cross-sectional study of southwestern Germany. *Med Klin*. 1997;92:642-49.
11. Koutras DA. Subclinical hyperthyroidism. *Thyroid* 1999;3:11-15.
12. Weintraub BD, Geishengion MC, Kourides IA and Fein H. Inappropriate secretion of thyroid stimulating hormone. *Ann Inter med*. 1981;95:339-51.
13. Bayliss RL. *Thyroid disease*. New York Oxford University Press. 1992 pp 442-423.
14. Hollowell JG, Stachling W, Sana Flanders, et al. Serum

TSH, T4 and thyroid antibodies in the United States population (1998 to 1994): National Health and Nutrition Examination Survey (NHANES III). *Journal of Clinical Endocrinology and Metabolism*. 2002;87:489-499.

15. Surks MI and Boucai L. Age and sex-based serum thyrotropin reference limits. *Journal of Clinical Endocrinology and Metabolism*. 2010;95:496-502.
16. Surks MI and Hollowell JG. Age-specific distribution of serum thyrotropin and antithyroid antibodies in the U.S. population: implications for the prevalence of subclinical hypothyroidism. *Journal of Clinical Endocrinology and Metabolism*. 2007;92:4575-4582.
17. Harman SM, Wehmann RE, Blackman MR. pituitary thyroid hormone function and thyrotropin responses to constant infusions of thyrotropin releasing hormone. *J Clin Endocrinol Metab*. 1984;58:320-26.
18. Muhammad Shoaib Khan, Aziz Marjan Khattak, Wasim Anwar, Faisal Saeed Khan, Iqbal Hussain and Arshaf Javed. Pattern of thyroid profile in elderly persons Gomal *Journal of Medical Sciences*. 2007;5:1-3.

Source of Support: Nil; **Conflict of Interest:** None

Submitted: 27-04-2017; **Accepted:** 31-05-2017; **Published:** 10-06-2017