

Original article:

Thyroid profile in geriatric population

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Abstract:

All over the world the elderly population is growing continuously and it is projected that in the next few decades, most of the elderly people will be in the developing countries. Improvement in living standards and better medical facilities has led to a decline in mortality and higher life expectancy among geriatric population. 2001 census has shown that the elderly population of India accounted for 77 million. The elderly population aged 70 and above, which was only 8 million in 1961 rose to 21 million in 1991 and to 29 million in 2001. Ageing leads to number of medical problems, which could be attributed to various physiological changes occurring in all organs of the body.¹ The aim of the study was to observe the thyroid parameter in geriatric age group to contribute to the ongoing debate whether the normal TSH level should be reconsidered in view of the large no of subclinical hypothyroidism cases in elderly. The Total T3 levels, is more in males as compared to females in both geriatric and young population, however the Total T4 and TSH levels were more in females as compared to males. This emphasizes the fact that there should be a separate normal range for elderly population to correctly diagnose an elderly to be hypothyroid and treat accordingly.

Keywords : T3 & T4 , TSH

Introduction

All over the world the elderly population is growing continuously and it is projected that in the next few decades, most of the elderly people will be in the developing countries. Improvement in living standards and better medical facilities has led to a decline in mortality and higher life expectancy among geriatric population. 2001 census has shown that the elderly population of India accounted for 77 million. The elderly population aged 70 and above, which was only 8 million in 1961 rose to 21 million in 1991 and to 29 million in 2001. Ageing leads to number of medical problems, which could be attributed to various physiological changes occurring in all organs of the body.¹ The aim of the study was to observe the thyroid parameter in geriatric age

group to contribute to the ongoing debate whether the normal TSH level should be reconsidered in view of the large no of subclinical hypothyroidism cases in elderly.

1. To estimate the levels of thyroid parameters i.e TSH, T3, T4.
2. To compare the above parameter with normal young population of the same sex.

Materials and Methods

The study was conducted at Padmashree Dr. D. Y. Patil Medical College and Hospital and Research Centre, Pimpri, Pune – 18. The study population includes the population in and around Pimpri mainly.

The study was designed as a community based cross – sectional study.

Study group :- The study group consist of 30 elderly ambulatory patients of both sexes.

Inclusion criteria :- To be eligible for the study group the persons were required to fulfill the following criteria.

1. Age between 60 – 65 years.

Exclusion criteria :- Subjects were excluded if the had any of the following condition.

1. Subjects not willing for consent
2. Presence of any documented acute or chronic illness.
3. Subjects on any supplements or medications.
4. Age below 60 years or above 65 years.

Control group :- The control group consists of 30 young ambulatory individuals of both sexes.

Inclusion criteria :- To be eligible for the study, the subjects were required to fulfill the following criteria.

1. Age between 25 – 30 years.

Exclusion criteria :- The subjects were excluded if the had any of the following conditions.

1. Subjects not willing for consent.
2. Presence of any documented acute or chronic systemic illness.

3. Subjects on any supplementation or medications.

4. Age below 25 years or above 30 years.

Study group – Group I (n = 30)

Control group – Group II (n = 30)

METHODS

- Serum Thyroid Stimulating Hormone (TSH) – Immunoenzymometric assay type 3²
- Serum Tri-iodothyronine (T3) – Competitive enzyme immunoassay type 5^{3,4}
- Serum Thyroxine (T4) – Competitive enzyme immunoassay type 5⁵

Statistical Analysis

The statistical method used for the analysis of data is Z test.

Observation and Results

In each group the biochemically abnormal thyroid profile of clinically normal patients was left out and 30 normal euthyroid profiles was considered.

The mean values of T3, T4, TSH was compared between same sex of group 1 and group 2. The results show that there is increase in TSH and simultaneous decrease in total T3 and total T4 in group 1 as compared to group 2. In other words with increase in age there is decrease in total T3 and T4 thyroid hormones and simultaneous increase in TSH.

Table No. 1 Age distribution and number of study population :

Study population	Group 1		Group 2	
	Male	Female	Male	Female
Age	60 – 65	60 – 65	25 – 30	25 – 30
Number	30	30	30	32

Table No. 1 depicts the study population distribution into cases and control, each of which is further divided into male and female sex having 30 subjects each.

The age group for cases are 60 – 65 years and the age group for control are 25 – 30 years.

Table No. 2 Levels of thyroid hormones – Total T3, Total T4, TSH in terms of Mean \pm S.D in Group 1 and Group 2

Study population	Group 1		Group 2	
	Males	Females	Males	Females
Age	61.9 \pm 1.72	62.6 \pm 1.62	27.2 \pm 1.6	27.2 \pm 2
Total T3	1.17 \pm 0.25	1.15 \pm 0.34	1.23 \pm 0.39	1.2 \pm 0.27
Total T4	5.54 \pm 1.42	7.87 \pm 2	6.64 \pm 1.6	8.63 \pm 2.25
TSH	4.23 \pm 1.70	5.34 \pm 1.24	3.36 \pm 2.6	3.54 \pm 2.8

Chart No - 1

Comparison of thyroid profile between males of Group 1 and Group 2

Total T3 » p value = 0.5 (not significant)

Total T4 » p value = < 0.05 (significant)

TSH » p value = < 0.05 (significant)

The chart compares the difference between the thyroid profile between group 1 and group 2 males. There is decrease in Total T3 and Total

T4 and increase in TSH in Group 1 as compared to Group 2

Chart No – 2

Comparison of thyroid profile between females of Group 1 and Group

Total T3 » p value = 0.68 (not significant)

Total T4 » p value = 0.08 (not significant)

TSH » p value = < 0.01 (significant)

The chart compares the difference between thyroid profile of Group 1 and Group 2 females.

There is decrease in Total T3 and Total T4 and increase in TSH in Group 1 as compared to Group 2

Chart No – 3

Comparison of Total T3 between males and females of Group 1 and Group 2

Group 1 » p value = 0.8 (not significant)

Group 2 » p value = 0.8 (not significant)

The chart compares the Total T3 levels between males and females of Group 1 and Group 2. The Total T3 levels are more in males as compared to females in Group 1 and Group 2.

Chart No – 4

Comparison of Total T4 between males and females of Group 1 and Group 2

Group 1 » p value = < 0.01 (significant)

Group 2 » p value = < 0.01 (significant)

The chart compares the Total T4 levels between males and females in Group 1 and Group 2. The Total T4 levels in males is less as compared to females in Group 1 and Group 2

Chart No - 5

Comparison of TSH between males and females of Group 1 and

Group 2

Group 1 » p value = < 0.01 (significant)

Group 2 » p value = 0.8 (not significant)

The chart compares the TSH levels between males and females in Group 1 and Group 2. The TSH levels in males is less as compared to females in Group 1 and Group 2

Discussion

Geriatric health has never been as important as it is today, due to rapid advances in medical science and increase in-depth knowledge about various disease has led to better management of diseases, in turn leading to decrease in mortality

and increase in geriatric population. However reference values have been reasonably well established in younger population and middle aged population, but data for the elderly population is lacking.

Aging is an inevitable phenomenon and leads to decreased function of invariably all the organs of the body, the effect of aging on thyroid gland and its impact in terms of hormone production is evaluated here.

This study showed that there is decrease in total T3 and total T4 and simultaneous increase in TSH hormone production in the normal geriatric population of both sexes in the age group 60 – 65 years when compared with the control group of young normal population.

Total T3

This study showed that there is a decrease in Total T3 levels in group 1 as compared to group 2 which was statistically not significant (p value = 0.68)

The Total T3 levels was more in males in group 1 as compared to females which was statistically not significant (p value = 0.8) and

The Total T3 levels was more in males in group 2 as compared to females which was statistically not significant (p value = 0.8)

There may be a shift in T4 deiodination from T3 to rT3 and hypothalamo – pituitary TSH dysfunction⁶

The thyroid gland produces hormone T4 which is converted to biologically active form T3 by the enzyme D1 and D2 and an inactive form rT3 by the enzyme D3 in the periphery.

however in the elderly there is deficiency of deiodinase enzymes D1 and D2 which results in deiodination of rT3 more than biologically active

form T3. This process in the neurons result in hypothalamo – pituitary dysfunction.

However the pathogenesis is not the same in all patients.

Total T4

There is alteration in Total T4 levels observed in normal geriatric population as compared with the normal young population.

This study showed that there is decrease in total T4 in group 1 as compared to group 2 which is statistically not significant (p value = 0.08)

The total T4 levels in females in group 1 was more than males which was statistically highly significant (p value = <0.01) and

The Total T4 levels in females in group 2 was more than males which was statistically highly significant (p value = < 0.01).

Clark T. Sawin et al in the Framingham study in thyroid deficiency in elderly population determined that the prevalence of thyroid deficiency was more in women as compared to men. The study also stated the increased TSH was associated with normal total T4 levels in few subjects and lower normal levels in the remaining subjects ⁷

An earlier study of thyroid function profiles in women aged 60 years or older reported higher serum T4 and TSH levels and decreased T3 and reverse T3 levels ⁸ similar findings were obtained in contemporaneous study comparing thyroid profiles in elderly men and women to those of younger population ^{9,10}

Total T4 levels were found to be either decreased or normal in the elderly, this can be explained by the fact that there is decreased production of thyroid binding globulin in elderly which results in decrease in total T4 measured, however there

is also decreased conversion of T4 to T3 due to deficiency of the enzymes deiodinase which results in comparative increase in T4 levels.

Thyroid stimulating Hormone

There was alteration in TSH in normal geriatric population as compared to the normal young population.

This study showed that there is a significant increase in the thyroid stimulating hormone (TSH) in group 1 as compared to group 2 which is statistically highly significant (p value = < 0.01).

TSH levels in females in group 1 was more than males and it was statistically highly significant (p value = < 0.01) and

TSH levels in females in group 2 was more than males and it was statistically not significant (p value = . 0.8).

The increase is consistant with various other studies done on geriatric population with normal T3 and T4 levels.

The increase in TSH with normal T3, T4 is consistent with subclinical hypothyroidism which is a biochemical diagnosis than a clinical diagnosis.

TSH levels in few studies were found to increase after the age of 60 years, throughout all decades. Males had stable TSH levels that were slightly higher than the female levels before age 60 and lower thereafter. ^{8,12,13}

The reason for increase in TSH in elderly is unclear however, It is believed that there is resetting of the hypothalamo – pituitary axis along with decrease in T3 which in turns stimulate TSH production due to decrease in the negative feedback of T3.

Conclusion:

This study concludes that there are differences in the thyroid profile levels between the geriatric population as compared to the younger population due to various age related changes.

There is decrease in Total T3, Total T4 and increase in TSH in the geriatric population as compared to the young population. There is also variation in thyroid profile between males and females in each geriatric and young population.

The Total T3 levels, is more in males as compared to females in both geriatric and young population, however the Total T4 and TSH levels were more in females as compared to

males. This emphasizes the fact that there should be a separate normal range for elderly population to correctly diagnose an elderly to be hypothyroid and treat accordingly.

This will decrease the burden of increasing amount of subclinical hypothyroidism cases among elderly, and eliminate the dilemma as to whether treat or not to treat. Thus the health care providers should understand the burden of subclinical hypothyroid population and decide clinically as to which patients require therapy and what will be the benefit of treatment.

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