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# Study of Thyroid Dysfunction in the Elderly

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***Abstract:***
***Back ground****: In older adults there is a reduction in pituitary sensitivity to thyroid hormones (altered set point), higher production of isoforms with lower biological activity and reduced functional capacity of thyroid with age.*
***Aim****: To evaluate thyroid function in the older age group and identify the most common form of thyroid dysfunction.*
***Materials and Methods****: Retrospective evaluation of records of patients who attended department of Nuclear Medicine, KGH from January to December of 2014 was conducted. They were assessed for thyroid function by Radioimmunoassay of T3, T4,TSH hormones.*
***Results****: 35.6% were men and 64.38% were women in the age group of 60-85 yrs. Mean age was 66.16± 11yrs. 57.5% were Euthyroid 12.3% were Hypo thyroid, 21.9% were marked as Subclinical hypothyroid. 2.73% were hyperthyroid and 5.47% had sub-clinical hyperthyroid. In Euthyroid individuals, 60-69 Yrs mean serum thyroid stimulating hormone ( S.TSH )levels were 2.28 and 1.29 in 70-85 yrs, P<0.05 was statistically significant. In men mean S.TSH was 2.4±0.97 µIU/ml and women 2.6±0.93 µIU/ml, P>0.05 the gender variation was not significant.*
***Conclusion****: Subclinical hypothyroidism was the more prevalent form of thyroid dysfunction in 60-69 yrs age group, women were more affected, there was no statistically significant gender variation in various types of thyroid dysfunction. S.TSH levels showed an inverse relationship with increasing age.*
***Key words****: Subclinical hypothyroidism, Elderly*

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## I. Introduction

Normal age related changes in anatomy and functions of thyroid encompass a decline in gland mass, body weight being a greater determinant of thyroid volume. Morphological pattern of progressive fibrosis ,increase in lymphocytes, decrease in follicle size and decrease in amount of colloid with resetting of pituitary threshold of TSH feedback suppression, leading to a decrease in TSH secretion[1]. However it appears that neither a decline in thyroid function nor histology correlate with the common measures of thyroid function[2]. Therefore biochemical profiling has become the corner stone in the diagnosis of thyroid disorders.

## II. Materials and Methods

Data was collected from existing laboratory registry, department of Nuclear Medicine, King George Hospital, of a hospital based population from January to December 2014. Retrospective analysis was performed after exclusion of patients on L-thyroxine, carbimazole, history of treatment with radioactive iodine, or having undergone thyroid surgery with histopathological review and pregnant women as stated on their request forms.

Records revealed that undiluted serum samples were analyzed for T3, T4, TSH hormones, T3 &T4 by Radioimmunoassay (RIA) and TSH by Immunoradiometric assay (IRMA) under standard laboratory precautions and conditions. Statistical analysis included simple statistics such as mean, median and standard deviation, percentages were calculated. For comparison of 2 groups, students T-test were used. Correlation was done by Pearson's test and P<0.05 provided statistical significance.

## III. Results

Study population comprised 73 elderly patients in the age group of 60-85 years with a mean age of 66.16 ± 11 yrs, 65.71 ± 9 yrs for men and 66.42 ± 12 yrs for women. 26 (35.6%) were men and 47 (64.38%) were women. The oldest male was 78 yrs and female was 85yrs respectively. Data consisting of 5 groups (fig 1) is presented in Table -1

**Figure-1 Types of thyroid dysfunction**

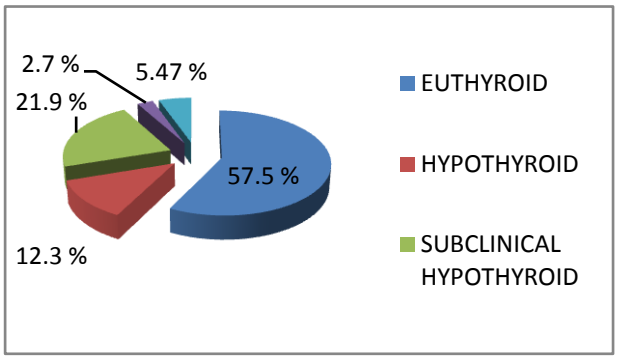


**Table-1 Gender distribution in various forms of thyroid dysfunction in the elderly**.

| THYROID DYSFUNCTION | n | % | MALE | % | FEMALE | % |
|---|---|---|---|---|---|---|
| EUTHYORID | 42 | 57.50 | 15 | 35.71 | 27 | 64.28 |
| HYPOTHYROID | 9 | 12.30 | 4 | 44.44 | 5 | 55.55 |
| SUBCLINICAL HYPOTHYROID | 16 | **21.90** | 6 | 37.50 | 0 | 62.50 |
| HYPER THYROID | 2 | 2.70 | 1 | 50.00 | 1 | 50.00 |
| SUBCLINICAL HYPERTHYROID | 4 | 5.47 | - | 0 | 4 | - |
| TOTAL | 73 | 100 | 26 | 35.61 | 47 | 64.38 |

57.5% were euthyroid. In 12.3% prevalence of thyroid deficiency as evidenced by clearly elevated serum Thyrotropin levels of greater than 10µIU/ml were noted .21.9% with slightly elevated S.TSH levels of 5-10 µIU/ml were marked as subclinical hypothyroidism with only 12.5% having very low T4 than expected. 44.4% of these had low T4 values and the remainders were in the upper half of normal range. Overall in 34% of the cases thyroid deficiency of various degrees was noted. Hyperthyroidism was present in 2.73% and subclinical hyperthyroidism (SCH) was observed in 5.47% .The thyroid hormone values of the various categories including age and gender distribution was given in Table -2.

**Table-2 Thyroid hormone values in various groups including age and gender**

| GROUP | GENDER | TOTAL(n) | MEAN T3 ng/ml | MEAN T4 µg % | MEAN TSH µIU/ml | MEAN AGE(YEARS) |
|---|---|---|---|---|---|---|
| EUTHYROID | TOTAL<br>MALE<br>FEMALE | 42<br>15<br>27 | 0.97<br>1.0<br>0.95 | 10.20<br>9.65<br>11.69 | 2.28<br>2.20<br>2.36 | 67.6<br>67.5<br>67.7 |
| HYPOTHYROID | TOTAL<br>MALE<br>FEMALE | 9<br>4<br>5 | NA<br>NA<br>NA | 7.8<br>8.4<br>6.1 | 23.4<br>29.6<br>17.1 | 65<br>60.25<br>68.25 |
| SUBCLINICAL HYPOTHYROID | TOTAL<br>MALE<br>FEMALE | 14<br>5<br>9 | -<br>-<br>1.0 | 9.3<br>8.7<br>10.5 | 6.50<br>6.28<br>6.64 | 63.68<br>65.16<br>62.80 |
| HYPER THYROID | MALE<br>FEMALE | 1<br>1 | NA<br>NA | 17<br>22 | <0.15<br><0.50 | 60<br>80 |
| SUBCLINICAL HYPERTHYROID | MALE<br>FEMALE | 0<br>4 | -<br>1.50 | -<br>11.72 | -<br><0.15 | -<br>63.25 |

When TSH values of euthyroid age groups were compared (Table 3) an inverse relationship was observed with reducing TSH values and increasing age which was statistically significant $p<0.05$.

**Table-3 Serum TSH (µiu/ml) distribution of various age groups in euthyroid subjects**

| AGE | 2.5th PERCENTILE | MEDIAN | 97.5th PERCENTILE | MEAN | PROBABILITY |
|---|---|---|---|---|---|
| 60-69 | 1.99 | 2.9 | 4.35 | 2.62 | P<0.05 |
| 70-79 | 1.138 | 1.65 | 3.70 | 1.797 | P<0.05 |

S.TSH values of >2.5 µIU/ml were present in 23.8%, >3 µIU/ml in 15.2% and > 4µIU/L in 7.1% of euthyroid individuals. No significant gender variation was noted in men with mean TSH of 2.4 ± 0.97µIU/ml and women 2.6 ± 0.93 µIU/ml, p>0.05. Most common thyroid dysfunction noted was SCH mean S.TSH 6.70 ± 1.36 µIU/ml with a slight female preponderance(n=10) out of 16 cases. Women were below 62yrs and men were over 65yrs which was not statistically significant (p>0.05) S.TSH values ranged between 6.0 - 6.86 µIU/ml in 60-69years and 4.6-5.6 µIU/ml in 70-79 years age group. On comparing with euthyroid group mean of SCH data was significantly different at p<0.05.

## IV. Discussion

The Neuroendocrine axis controlling TSH secretion may be altered during normal aging process. The underlying mechanism which is unclear may reflect an increased prevalence in occult thyroid disease[3] or age related altered TSH[4] set point as suggested by Bremner et al[5] in their Busselton thyroid study 1981-1994 where increase in S.TSH was in people with lowest TSH at baseline or due to a reduced TSH bioactivity in the elderly. Previous studies of age-related physiological alteration considered a reduction in TSH rather than an increase[6].

Recent studies [7] [8] [9] [10] are in contrast as evidenced in US NHANES study which showed a shift towards higher TSH levels with increasing age even when individuals with positive TPO AB or AB were excluded with increase in median TSH from 1.28 µIU/ml (20-29 yrs) to 1.99 µIU/ml in 80 yrs and above, TEARS study documented 1.58 µIU/ml in 31-40 yrs to 1.86 µIU/ml at > 90 yrs, Kahapola et al reported increase from 3.75 µIU/ml at 40 yrs to 5.0 µIU/ml at 90 yrs in the 97.5$^{th}$ percentile while in Pedro Rosario's Brazilian study median TSH was 1.52 µIU/ml in 18-16 yrs, 1.85 µIU/ml at 75-80 yrs with 97.5$^{th}$ Percentile at 4.6 µIU/ml.

However an Italian study by Mariotti et al[11] [12] of healthy centenarians aged 100-110 yrs reported TSH concentrations to be lower than elderly aged 60-80yrs and healthy young adults 20-60 with median TSH 0-99 vs 1.17vs 1.70 µIU/ml. Several studies[13] [14] did not report higher TSH levels but showed a trend of an inverse relationship between TSH and age[15]. Present study has recorded similar lower levels of 1.79 µIU/ml mean and 1.65 µIU/ml median in 70-80-yrs vs. 2.5 µIU/ml in 60-69yrs.

Scotland Tears Study & Busselton health surveys also reported that males had significantly high median TSH compared to females, while NHANES study reported greater concentration in females. The 1977 Wickham study and recent Kahapola study found no significant association between TSH and gender. In concurrence with above studies no significant difference (p>0.05) was found between TSH values of euthyroid men & women in the present study.

Present study observed a 2.73% prevalence of hyperthyroidism similar to studies reporting 1-2% in community residing individuals[16]. No gender difference was observed in our study while a population based Tayside Scotland survey showed increase incidence and decrease in gender difference with increasing age[17]. Wickham study, England identified a prevalence rate in women 10 times more in men. Subclinical hyperthyroidism in the present study was 5.47% similar to studies[18] reporting 1-6% with a high rate of persistence and low rate of progression to overt hyperthyroidism. A prevalence of 12.3% of overt hypothyroidism was observed though several studies have reported 1-2% of increased TSH and low FT4 level (at a single point of time). Major cause of hypothyroidism in elderly is prior treatment of hyperthyroidism with Radioiodine which explains the high percentage recorded in our patients whose data is obtained from Nuclear Medicine department case records.

In population based studies, TSH measured at single point in time, SCH is highly prevalent in women and with increasing age upto 20% over the age of 60yrs[19] [20]. Present study recorded 21.9% prevalence in 60-69 years age group (p<0.05). Age related changes in thyroid physiology necessitate a distinction between high normal and mildly elevated S.TSH concentration. In the clinical scenario usage of age related TSH reference ranges may improve diagnostic accuracy but data in various studies such as Kahapola *et al* suggest that reclassification is modest 1-2% and thereby minimizing the benefits accrued. In the present study 2% of the cases of SCH were included into euthyroid group[21]. In such cases of mild elevation in S.TSH routine treatment is not recommended which returns to normal without treatment[22].

## V. Conclusion

Subclinical hypothyroidism was the most common form of thyroid dysfunction in the elderly aged 60-6yrs. Analysis of the data revealed an inverse relationship between reducing S.TSH levels with increasing age which was statistically significant. Though women were more affected across the spectrum of thyroid dysfunction of hypothyroid, hyperthyroid, sub clinical hypothyroid and subclinical hyperthyroid, the gender differences were not significant. Further studies of ethnic population are needed to evaluate S.TSH levels in older adults for a better clinical outcome.

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