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Original Research Article

# Prevalence of thyroid dysfunction in namakkal district -A hospital based study

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ABSTRACT

**Introduction:** Thyroid disorders are most common endocrine disorder in India but the prevalence studies on these dysfunction is limited.
**Materials and Methods:** All subjects who visited the hospital for a period of four months to have thyroid function tests (TFTs) on their first outpatient visit were included in the study.
**Results:** Thyroid disordrs were present in 22.11 % of the total 2510 subjects . The prevalence rate was higher in females (64.8%) than males (35.2%) with (p=0.0003).
The prevalence of hypothyroidism in the study population was 64.32 % (n = 357). In our study those with primary hypothyroidism were predominant (55.18 %, 197 out of 357) and 43.1 % (154 out of 357) were having sub clinical hypothyroidism and 6 of 357 were having secondary hypothyroidism. The prevalence rate of hyperthyroidism was 52.6 % (n-188) . The majority were subclinical hyperthyroidism (65.90 % , 124 out of 188) ,30.8 % (58 out of 188) had primary hyperthyroidism and3% ( 6 out of 188) had secondary hyperthyroidism.
**Conclusion:** In our study thyroid function abnormalities were noted in 15.73 % of all subjects. Thyroid disorders were common in age of >20 years than 20-40 ,40-60 and and >60 year categories. The prevalence of primary hypothyroidism was found to be higher than subclinical hypothyroidism, while in hyperthyroidism subclinical condition was predominant compared to primary hyperthyroidism.



## 1. Introduction

Thyroid is a small, butterfly-shaped gland located in the mid-line of the neck, anterior to the trachea and inferior to the larynx.[1] Thyroid disorders are one of the most common endocrine disorders world wide and its prevalence diverges widely on the basis of geographic distribution.[2] Previous studies reveal that almost 42 million Indians suffer from thyroid disorders.[3] A recent study across 8 major cities of India revealed the prevalence of thyroid disorders as 11 % in the urban population compared with only 2% in the UK and 4.6% in the USA , with women being three times more prone to the disease than men.[4] The prevalence of primary hypothyroidism increased from 3.12% to 5.14% in females and 0.51% to 0.88% in male over the last 8 years. The condition is more prevalent in older age groups, especially women above 51 years of age .Our study aims to determine the pattern and prevalence of thyroid dysfunction among various age group.

## 2. Materials and Methods

Study type: Observational case control study.

All subjects who visited the our hospital for a period of four months for thyroid function tests (TFTs) on their first visit were screened after getting Institutional ethical

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approval. After getting informed consent from the subjects, a detailed history and anthropometric data like name ,age height ,weight, waist circumference, physical and clinical characteristics were recorded. Subjects were grouped based on gender and age as 16-19 , 20-45 and ≥ 46years).The free triiodothyronine (T3),free tetraiodothyronine (T4) and thyroid stimulating hormone (TSH)test reports examined by electrochemiluminescence assay (VITROS ECi immunoassay system Ortho Diagnostics.[4] The subjects with subclinical or overt, hypo or hyperthyroidism were used to delineate thyroid disorders. Subjects were classified using following definitions:

Primary hypothyroidism: TSH > 5.5 $\mu$IU/mL, F T4 <0.78 ng/dL , FT3 < 2.5 pg/mL.

Subclinical hypothyroidism: mild condition : TSH 5.5-9.9 mIU/L with normal F T4, normal FT3 ,severe: TSH>10 mIU/L. Secondary hypothyroidism: F T4 <5.1 ng/dL ,F T3 <2.5 pg/mL and a TSH level is not increased.

Hyperthyroidism: TSH <0.4 $\mu$IU/mL and FT3 >5.5 pg/mL or FT4 >3.1 ng/dL.

Subclinical hyperthyroidism: Grade I: TSH < 0.4 $\mu$IU/mL , normal fT3, normal FT4., Grade II: TSH: < 0.0001-O.O1 $\mu$IU/ml

Secondary hyperthyroidism: FT3 >5.5 ng/dL or FT4>3.1 ng/dL and a TSH level is not low.[5]

Subjects with subclinical/overt hypothyroidism and overt hyperthyroidism were included in the study and women of menopausal age ,who had undergone any surgery and who were on treatment for thyroid diseases were excluded .

## 3. Result and Discussion

A total of 2510 subjects who underwent estimation of TFTs were included in the study. 883 (35.2%) were male and 1627 (64.8%) were female subjects. The majority of the study population has been found to be consuming iodized salt(92%,n=2309)

The mean age of the study subjects were 42.71 years who were in range of 18 to 80 years . In our study, subjects with age <20 years were 123 (4.9%), in 21 to 40 years were 924 (36.8 %),in 41 to 60 years 1347(53.7%),and 61 to 80 years of age 116 (4.6%). There was no statistically significant variation in F T3 ,F T4 ,Serum calcium, phosphorus and glycated haemoglobin level based on gender [Table 1]. Mean age was more in male subjects than females and was not statistically significant.

Thyroid function abnormalities were present in 22.11 % of subjects (Table 3). The prevalence rate of thyroid dysfunction was higher in females (64.8%) than males (35.2%) and it was statistically significant (p=0.0003). Thyroid disorders were common in female subjects than males in all age groups; it was statistically significantly high in 41-60 year age groups and followed by 20-40 years of age compared to subjects in age group less than 20, and >60 age group. The association age with prevalence of thyroid disorders was statistically significant.

In our study the prevalence of hypothyroidism in the population was 64.32 % (n = 357). Those with primary hypothyroidism were predominant (55.18 %, 197 out of 357) and 43.1 % (154 out of 357) were having sub clinical hypothyroidism and 6 of 357 were having secondary hypothyroidism. The prevalence rate of hypothyroidism was more in female (11.5 %) than male( 5.5 %) and was statistically significant (p=0.005). The prevalence of hypothyroidism was 1% in <20 years , 3.1 % in 20-40 and 4.2% in those with 40-60 years and 4% in group 60 years of age [Table 2], and it was statistically significant in the age group of 40-60 years.

Hypothyroidism may be overt or subclinical. The prevalence of Thyroid diseases occur more commonly in women than men, in part because of the autoimmune nature of many thyroid disorders. Hypothyroidism, and thyroid nodules occur frequently in both pre- and postmenopausal women. Pregnancy is also associated with changes in thyroid function.[6] Hypothyroidism increases with age and is nearly 10 times more common in females than in males. Another reason for the prevalence of thyroid disorders in women is that there is an interplay between thyroid hormones and the hormones that fluctuate during the menstrual cycle. Thyroid problems can happen at any time but they are especially common in women during and after the menopause when hormone levels are changing.[7]

Similar results were observed in a clinic-based observational study by Mahanta et al in 2017.[8] The prevalence and incidence of hypothyroidism varies because existing studies differ significantly with regard to population age, geographic location, environmental factors such as dietary iodine and goitrogen food intake, genetic characteristics of study population, and criteria used to define incidence and grade of thyroid disease. The prevalence was more in female when compared to male in the age group of 21-40 years ,but it was not significant statistically.(p=0.17) A prevalence study in a tertiary care hospital in Kerala had shown that prevalence was higher in male than female population though the age group was in 21-40 years of age.[4]

No difference was found in the prevalence of calcium,phosphorus and HbA1C among patients with hypothyroidism and those without. Central hypothyroidism was observed in 10 (4% )hypothyroid subjects with a frequency of 2% in male and female population.

Subclinical hypothyroidism (SCH) was observed in 43.1 % (n-154) of the population . The prevalence rate of SCH was higher 108 (4.3%) in the female than male subjects 46 (1.8 %) and it was statistically significant (p =0.00003) . The prevalence rate of SCH was highest (4.2%) in the age group of 41-60 years followed by 2 % in <20 years 1.7% in the age group of 21-40 years with ((p= 0.00009). Rate of SCH was higher in female compared to male subjects

**Table 1:** Description ofbiochemical parameters

| Parameter | All subjects (n = 2510) Mean ±SD | Male (n = 883) Mean ±SD | Female (n = 1627) Mean ±SD | Deviation fromlinearity (p value) |
|---|---|---|---|---|
| Age (years) | 42.71 ± 12.8 | 45.62 ± 7.8 | 40.67 ± 5.9 | 0.243 |
| FT3(pg/ml) | 6.4±100.9 | 4.77±18.10 | 7.28 ±124.65 | 0.124 |
| FT4 ( ng/dl ) | 1.71±5.59 | 1.92 ±7.89 | 1.59 ±3.8 | 0.194 |
| TSH ( uIU/ml) | 6.37 ±18.29 | 6.09±18.69 | 6.52 ±18.07 | 0.003* |
| Haemoglobin: (mm of Hg) | 13.17± 4.19 | 13.85±1.78 | 13.60 ±4.9 | 0.000* |
| Serum Calcium ( mg/dl) | 10.1 ± 5.14 | 10.12±.69 | 10.09 ±.64 | 0.097 |
| SerumPhosphorus ( mg/dl) | 4.87±2.09 | 4.982±3.11 | 4.817±1.23 | 0.213 |
| Glycated Haemoglobin(HbA1C) % | 5.03±2.15 | 5.1283±2.21 | 4.97±2.09 | 0.052* |

**Table 2:** Prevalence of thyroiddisorder and its distribution in various age group

| Classification | Age (years) group | | | | Total |
|---|---|---|---|---|---|
| | < 20 | 21 to 40 | 41 to 60 | 61 to 80 | |
| Normal | 101(4.0%) | 732(29..2%) | 1023(40.8%) | 99(3.9%) | N=1955(77.9%) |
| Primary hypothyroidism | 3(1%) | 79(3.1%) | 105(4.2%) | 10(4%) | 197(7.8%) |
| Secondary hypothyroidism | 0(0%) | 3(.1%) | 3(.1%) | 0(0%) | 6(2%) |
| Subclinical hypo thyroidism | 6(.2%) | 43(1.7% ) | 105(4.2%) | 0(.0%) | 154(6.1% ) |
| Primary hyperthyroidism | 5(2%) | 23(.9%) | 26(1.0% ) | 4(.2%) | 58(2.3%) |
| Secondary hyperthyroidism | 0 (0%) | 4 (2%) | 1(0%) | 1(0%) | 6(2%) |
| Subclinical hyperthyroidism | 6(2%) | 38(1.5%) | 78(3.1%) | 2(.1%) | 124(4.9%) |
| Central hypothyroidism | 2(1%) | 2 (1%) | 6(2%) | 0(0%) | 10(4%) |

**Table 3:** Prevalence of thyroiddisorders in relation to gender

| Classification | Gender | | |
|---|---|---|---|
| | Male | Female | |
| Normal | 706(28.1%) | 1249(49.8%) | 1955(77.9%) |
| Primary hypothyroidism | 67(2.7%) | 130(5.2%) | 197(7.8%) |
| Secondary hypothyroidism | 2(.1%) | 4(2%) | 6(2%) |
| Subclinical hypo thyroidism | 46(1.8%) | 108(4.3%) | 154(6.1%) |
| Primary hyperthyroidism | 21(.8%) | 37(1.5%) | 58(2.3%) |
| Secondary hyperthyroidism | 0(0%) | 6(2%) | 6(2%) |
| Subclinical hyperthyroidism | 37(1.5%) | 87(3.5%) | 124(4.9%) |
| Central hypothyroidism | 4(2%) | 6(2%) | 10(4%) |

in all ages. Liu and Chen conducted a study on 58,152 healthy individuals with subclinical hypothyroidism (SCH) in Chongqing, China. They found that the prevalence of SCH in females was 14.76%, which was significantly higher than that in males (7.97%)(9)

The occurrence rate of hyperthyroidism was 52.6 % (n-188). The majority were subclinical hyperthyroidism (65.90 %, 124 of 188 people) ,30.8 % (58 out of 188) had primary hyperthyroidism and 3% ( 6 out of 188) had secondary hyperthyroidism. The prevalence rate was 3.11 % in female than males 2.24 % and found to be significant in subclinical hyperthyroidism (p=0.011). The prevalence rate of hyperthyroidism was highest (3.41 %) in 41-60 years age group followed by 2.17 % in 20-40 years and the association was found to be statistically significant (p = 0.001). Rate of hyperthyroidism was more in female subjects than males of all ages and it was found to be significant statistically in 41-60 years age group (p =0.006) but not in other age groups. Similar results were observed in a study by Velayutham K et al in 2015. In their study low TSH (<0.4 mIU/ml) was seen in 1.5% of the study population and it include both subclinical and overt thyrotoxicosis.[9] A previous study from Cochin proved combined prevalence of subclinical and clinical thyrotoxicosis with 2.9%. The

prevalence of thyrotoxicosis in women of Pondicherry was found to be 1.8% while In an epidemiological study in eight cities of India, the prevalence of clinical plus subclinical thyrotoxicosis was 1.9%.[10,11]

Subclinical hyperthyroidism may be defined as a clinical condition with peripheral thyroid hormones normal and low serum thyrotropin (TSH) value. The etiology has been the same as that of overt hyperthyroidism. The predominant cause for endogenous subclinical hyperthyroidism might be the release of excess thyroid hormone by the gland .The health implications include general symptoms, its effect on the cardiovascular system and reduced bone density. The increased frequency of atrial fibrillation and the increased mortality reported are especially serious. Studies states that menopausal women with subclinical hyperthyroidism are found to have severe bone loss than reproductive women with thyroid dysfunction.[12]

The incidence of subclinical hyperthyroidism was 3.1 % (n – 78). The prevalence rate was higher in females (1.9 %) than malepopulation (3.1 %) but it was not statistically significant.(p =0.13). Those in age group of 41-60 years had highest prevalence followed by 2 % in <20 years. The prevalence of subclinical hyperthyroidism also was found to be higher in female,may be because of more female population in our study than male. No significant change in subclinical hyperthyroidism was observed in male and female population in a study done by S Wilson et al in 2016.[13]

In endogenous subclinical hyperthyroidism, the moderate increase in thyroid hormones in the circulation in female population might be the thyroid itself, as in Graves' disease, multinodular goitre, solitary functioning thyroid nodules or thyroiditis. Exogenous subclinical hyperthyroidism can be due to overzealous thyroid hormone replacement therapy or intentional suppressive thyroid hormone therapy, as in patients with thyroid cancer, thyroid nodules or goitre. Persons with subclinical hyperthyroidism usually do not present with the specific signs or symptoms associated with overt hyperthyroidism.[14]

The pathophysiological consequences of mild thyroid dysfunction still remain unclear. The pathophysiology of subclinical hyperthyroidism might be the sensitivity of the pituitary gland to respond to minor elevations in serum or tissue T4 and T3 levels.[15] Subclinical hyperthyroidism are clinically classified into two categories: patients with low but detectable serum TSH (0.1 to 0.4 mIU/L), and patients with serum TSH undetectable (less than 0.01 $\mu$IU/mL) 16. The extend of progression to overt hyperthyroidism is higher in persons who have undetectable TSH levels compared with those who have low but detectable levels.[16] In our study 28 subjects were having TSH level in undetectable range and 18 of the subclinical hyperthyroidism subjects were having elevated glycated haemoglobin level.

Hyperthyroidism might increase the gene expression of GLUT4 and uptake of glucose in skeletal muscles. Thyroid hormones may directly regulates the insulin secretion by beta cells. Excess circulating thyroid hormones in hyperthyroidism has been proved to be associated with poor glycaemic control, leading to hyperglycaemia and insulinopenia.[17] When individuals develop hyperthyroidism, nearly 2–3% of them develop overt diabetes. Nearly 50% of those with Graves' disease have shown to have some degree of glucose intolerance in previous studies. Diabetic patients with hyperthyroidism experience exacerbated glycaemic control. Thyrotoxicosis may trigger diabetic complications as diabetic ketoacidosis and endothelial dysfunction. These endothelial dysfunction increases the risk of cardiovascular comorbidities. Thyroid hormone have an effect on various organs to affect glucose metabolism (Table 2). It increases gastrointestinal motility, enhances glucose absorption[18] and in the liver, it increases the activity of phosphoenolpyruvate carboxykinase (PEPCK), the enzyme which enhances gluconeogenesis. This regulation may be direct action of the thyroid hormone or indirectly through the action of glucagon or catecholamine hormone.

## 4. Conclusion

The present gives an insight about the prevalence of thyroid disorders. Majority (92 %) of the subjects were including iodized salt in their regular diet. In our study thyroid function abnormalities were noted in 15.73 % of all subjects and was more common in female than male in all age groups. In our study the prevalence of primary hypothyroidism was found to be higher than subclinical hypothyroidism, while in hyperthyroidism, subclinical condition was predominant. Hence a possible etiological factors goitrogensic food, agricultural pollutants that interfere normal thyroid functioning and any deficiency of selenium, iron and zinc which may impede with thyroid function needs to be evaluated in future studies involving hypothyroidism; as iodine deficiency was not noticed in any of the study subjects.

## 5. Source of Funding

None.

## 6. Conflict of Interest

None.

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