

# An Analytical Study on Epidemiology and Biochemical Analysis of Hypothyroidism in the Adults in a Teaching Hospital

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## ABSTRACT

**Background:** Hypothyroidism is one of the commonest endocrinological disorders in western population. The annual incidence of primary hypothyroidism in Europe is 3.5 per 1000 populations in women and 0.6 pr 1000 in men. Hypothyroidism was first described by Gull in 1874. Zondek in 1918 described Myxedema Heart. Iodine deficiency is more prevalent in central Africa, Asia and Mountain regions in India, and it is most common in Females. It is one of the common causes of Infertility in Females. Patients with Hypothyroidism are more prone to develop coronary artery disease.

**Aim of the study:** To know the epidemiology, biochemical analysis of Hypothyroidism in Adults in a teaching hospital.

**Materials and Methods:** This study has been conducted in Apollo Medical college, Chittoor (AP) in the department of General Medicines. This study has been conducted for 1 year from Sept. 2020 to August 2021. Total 90 patients are included in this study. The age group included is between 20 and 70 years.

**Results:** We have included 90 patients in this study out of these 90, 57 patients are females and 33 patients are males. The common age group involved is between 20 and 40 years.

**Conclusion:** Hypothyroidism is commonly seen in Females. Iodine deficiency is most common cause. It also causes infertility in Females. Early diagnosis and Management can prevent the cardiac complications.

**Keywords:** Hypothyroidism, Thyroxin, Lipid abnormalities, coronary artery disease.


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## INTRODUCTION

Hypothyroidism is a common endocrinological disorder in India. Hypothyroidism is characterized by a broad clinical spectrum ranging from an overt state of Myxedema, end organ effects and Multi system failure to an asymptomatic or subclinical condition with normal levels of Thyroxine and triiodothyronine and mildly elevated levels of serum thyrotropin.<sup>1</sup>

The prevalence of Hypothyroidism in the developed world is about 4 to 5% and the prevalence of subclinical Hypothyroidism in the developed world is about 4 to 15%. In India communicable diseases are priority health concerns due to their large contribution to the national disease burden. In India Hypothyroids usually categorized under the cluster of iodine deficiency disorders which were presented in terms of total goiter rates and urinary iodine concentrations.<sup>2</sup>

Thyroid gland is one of the largest of endocrine glands. Normally weighing 15-20 gms in adults. The Thyroid secretes 2 major hormones. Thyroxin and triiodothyronine commonly called T<sub>4</sub> and T<sub>3</sub> respectively. Thyroid secretion is controlled primarily by

Thyroid stimulating Hormone (TSH) secreted by Anterior pituitary gland.<sup>3</sup> 93% of metabolically active hormones secreted by thyroid glands are thyroxine and 7% of triiodothyronine Triiodothyronine 4 times as potent as thyroxin. Hypothyroidism like Hyperthyroidism is often initiated by autoimmunity against the thyroid gland (Hashimoto's disease). This causes progressive deterioration and finally Fibrosis of the gland which resultant diminished or absent secretion of thyroid hormone. The investigations done in Hypothyroidism are complete blood picture, Random Blood sugar, Lipid profile, T<sub>3</sub>, T<sub>4</sub>, TSH, electrocardiogram (ECG) and 2D Echo, to rule out cardiac abnormalities like pericardial effusion.

The clinical feature includes Fatigue, Weight gain, dry skin, constipation, hair loss pallor, shortness of breath, cardiac complications include Bradycardia, coronary artery disease and Pericardial effusion. In young females Hypothyroidism causes infertility. Sometimes subclinical Hypothyroidism can also cause some complications. Subclinical Hypothyroidism called when T<sub>3</sub>, T<sub>4</sub> are in normal limits and Mild elevation of TSH (thyroid

stimulating hormones). In India hypothyroidism is usually categorized under the cluster of Iodine deficiency disorders (IDDs), which were represented in terms of total goiter rates and urinary iodine concentration, typically assessed in School-aged children. India is supposedly undergoing a transition from iodine deficiency to a sufficient state.

**MATERIALS AND METHODS**

This study has been conducted for 1 year from September 2020 to August 2021 in Apollo Medical college, Chittoor AP, in the department of General Medicines. We have included 90 patients in this study out of these 90, Females were 57 and Males were 33 patients, The age group involved in between 20 years and 70 years. The common age group involved is between 20 and 40 years. We have obtained the consent forms in their local language. After taking detailed clinical history, we have examined all the patients in detail and we have advised the investigations like complete blood picture, random blood sugar, lipid profile, Blood urea, serum creatinine, T<sub>3</sub> T<sub>4</sub> TSH, ECG, 2D Echo, we have recorded weight of all the patients. The data is collected systemically and computerized by using MS office.

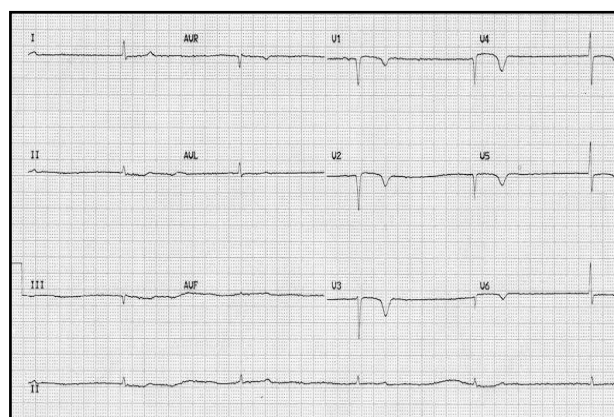
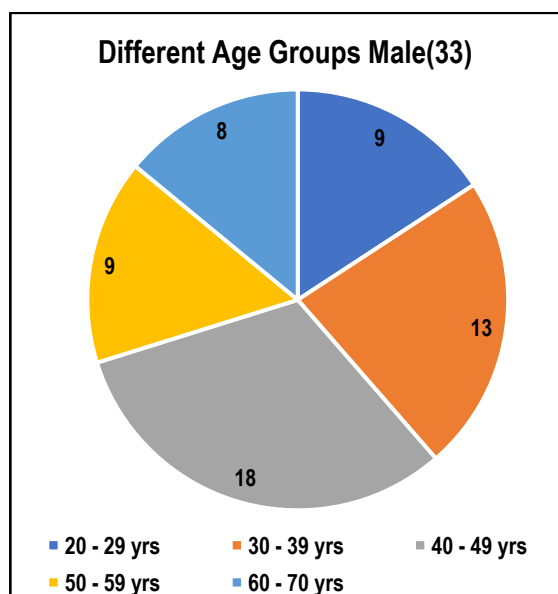
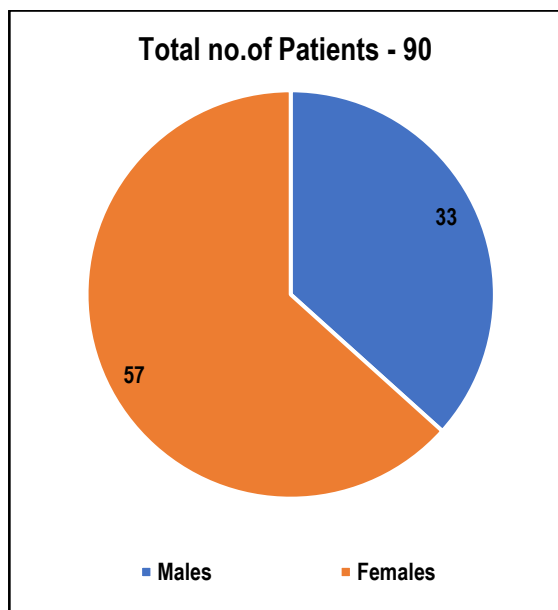
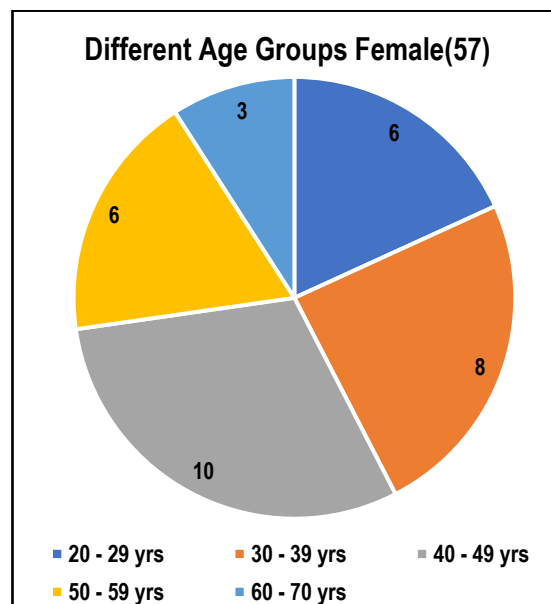


Fig 1: Low Voltage Complexes in Hypothyroidism

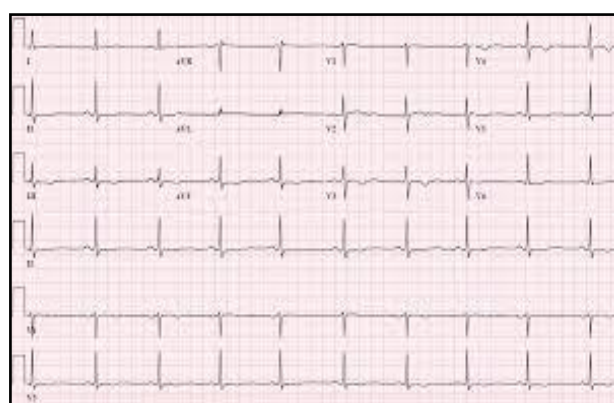


Fig 2: T Wave Inversions in Hypothyroidism



Fig 3: Bradycardia in Hypothyroidism



Fig 4: Pericardial effusion on 2D echo



Fig 5: Pericardial effusion on X-Ray chest

**RESULTS AND DISCUSSION**

We have included 90 patients in our study. Out of these 90 patients 33 were males and 57 were females. The common age group involved is between 20 years and 40 years. In Males nearly 40% and in Females 39%.

The study conducted by WHO in 2004 shows Females and Male is 3 :1 and the common age group is 4<sup>th</sup> decade.<sup>4</sup> The common clinical features in Hypothyroidism are weight gain, dry skin, fatigue, constipation, hair loss, cold intolerance, hoarseness of voice. In our study weight gain was noted in 100% of patients, Dry skin in 79% constipation in 54.5% and other features are noted in 33.3% patients. Unnikrishnan et al observed almost similar results in their study weight gain is 100% patients. Dry skin in 71.5%, constipation in 51.3% and fatigue in 62% patients.<sup>5</sup> Thyroid function tests are more important in the diagnosis of Hypothyroidism. Among TFT (Thyroid function tests) TSH (Thyroid stimulating Hormone) test is very important. The normal values of T<sub>3</sub> T<sub>4</sub> TSH are 77-135 ng/dl. ; 5.4-11.7 microgm/dL and 0.34- 4.25 microunits/ml respectively. In Hypothyroidism T<sub>3</sub> and T<sub>4</sub> levels will be decreased and TSH Levels are increased.

In our Study Mild Hypothyroidism is noted in 33.8% patients in Males and 30.7% in Females and The TFT levels are T<sub>3</sub> is 80-90 ng/dl and T<sub>4</sub> is 4.5 microgm/dl. And TSH is around 10-20 microunits/ml And severe Hypothyroidism was seen in Males (20.2%) and in females 20.5% T<sub>3</sub> level are (50 ng/dl : T<sub>4</sub> is < 2.5microgm/dl and TSH Levels are > 40 microunit/ml. The studies Conducted by Demass at al shows almost similar results in their studies.<sup>6</sup>

Among electrocardiogram, changes bradycardia is very common abnormality. The other abnormalities are low voltage complexes. T wave inversion. In our study Bradycardia was noted in 90.25% in Males, 91.6% in Females and low voltage Complexes in 93% and 96% respectively. The study conducted by Jagadish et al shows that Bradycardia in 93.2 patients and low voltage complexes in 89.5%.<sup>7</sup> We have noticed 4 cases of periodical effusion on X-ray chest an 2D Echo.

**Table 1: Different Age Groups**

AGE GROUP IN YEAR	n (M) 33	n (F) 57
20 – 29 yr.	6 (18.79%)	9 (15.78%)
30 - 39 yr	8 (24.4%)	13 (22.8%)
40-49yr	10 (30.5%)	18 (31.57%)
50-59yr	6 (18.79%)	9 (15.78%)
60-70yr	3 (9.95%)	8 (14.3%)

**Table 2: Different investigations Thyroid Function Test**

T3 (ng/dl) (% of patients)	T4 (microgm/dl) (% of patients)	TSH (microunit/ml) (% of patients)	LDL (mg/dl) (% of patients)
80-90 (28.9%)	4-5(31.25%)	10-20(33.8%)	130-190(33.7%)
70-80(18.5%)	3.5-4 (18.57%)	20-30(19.8%)	145-150(15.6%)
60-70(32.5%)	3.0-3.5(22.6%)	30-40(25.5%)	150-155(19.7%)
<50(ng/dl) (17.9%)	<2.5-(microgm/dl) 28.5%	40 (microunit/ml) (20.2%)	>160(mg/dl) (20.5%)

**Table 3: Different Clinical Features**

Clinical Features	n (M) 33	N (F) 57
Weight gain	33 (100%)	57(100%)
Dry skin	28 (84.8)	51 (89.47%)
Fatigue	26 (78.9%)	47 (82.45%)
Constipation	18 (54.5%)	39(68.42%)
Cold intolerance & others	11(33.3%)	26 (38.6%)

**Table 4: Different ECG Changes**

ECG Changes	n (M) 33	N (F) 57
<b>Sinus bradycardia</b>	30 (90.25%)	52 (91.6%)
<b>Low voltage complexes</b>	31 (93.4%)	54 (96.8%)
<b>T wave inversion</b>	26 (78.9%)	49(86.4%)
<b>Other abnormalities</b>	18 (54.5%)	28 (32.2%)

Hypothyroidism is one of the common and chronic endocrinological disorders in the world. It is More commonly. Seen in Females than Males. Hypothyroidism includes the Overt state of Myxedema, end organ effects and multisystem failure to asymptomatic sub clinical hypothyroidism in which thyroxine and triiodothyronine are normal and mild elevation of TSH is seen. The world Health Organization estimates that about 2 billion people are iodine deficient based on urinary excretion data. In India mountain regions like Meghalaya, Assam, Himachal Pradesh are commonly affected. It is estimated that 71 millions peoples are affected by goiter in the country.<sup>8</sup> The Thyroid gland consists of numerous spherical Follicles, composed of Thyroid Follicular cells, that surrounded, secreted colloid portentous Fluid Containing large amounts of Thyroglobulin, the protein precursor of thyroid hormones. The Thyroid hormone secretion is regulated by TSH. Thyroid Hormones are derived from thyroglobulin, a large, iodinated glycoprotein. After secretion into the thyroid ie., subsequently compelled via another linkage re up takes of Tg into thyroid Follicular cells allow proteolysis and the release of newly Synthesized T<sub>4</sub> & T<sub>3</sub>.<sup>9</sup> Common clinical features includes weight gain, Fatigue, Dry skin, constipation, Hair loss. Anemia, cold intolerance. Myxedema coma is medical emergency which occurs with overt Hypothyroidism. The Cardiac complications are coronary artery disease, bradycardia, pericardial effusion. In our study we have noticed 2 pericardial effusion cases which were diagnosed by X-ray chest and 2D echo. Severe Hypothyroidism cases are seen in nearly 20% patients the study conducted by Kapil et al shows nearly 16.5% patients were having severe Hypothyroidism.<sup>10</sup> Iodide uptake is a critical First step in Thyroid hormone Synthesis. Ingested iodine synthesis is bound to serum proteins, particularly albumen unbound iodine is excreted in urine. The Iodine transporter pendrin is located on the apical surfaces of thyroid cells and mediates iodine effusion into the lumen. Mutation of pendrine gene causes Pendred syndrome, a disorder characterized by defective organification of iodine goiter and sensorineural deafness. T<sub>4</sub> is secreted from the thyroid gland in about twenty-fold excess over T<sub>3</sub>. Both hormones are bound to plasma proteins including thyroxine binding globulin (TB G). The plasma binding proteins increase the pool of circulating hormones delay hormones clearance and may modulate hormone delivery to selected tissue sites. The common causes of Hypothyroidism are autoimmune thyroiditis, iatrogenic treatment subtotal thyroidectomy. Drug like, Lithium, Amiodarone, Amyloidosis, Sarcoidosis. A normal TSH levels excludes primary but not secondary Hypothyroidism. TPO antibodies are present in > 90% of patients with autoimmune Hypothyroidism. In our study 2 women, who are having Hypothyroidism are also pregnant. Since we aim to focus on clinical features and Biochemical analysis of Thyroid disorders. We have not recorded the other parameters. The study conducted by A. Sangitha Wagrar et al shows a 12.7% prevalence of Thyroid disorders in pregnancy.

## CONCLUSION

Hypothyroidism is a common endocrinological disorder. Females are more commonly affected than Males. Infertility is common in Females because of Hypothyroidism. In mountain regions Iodized salt can decrease the incidence of Hypothyroidism. With thyroxin replacement cardiac complications can decreased.

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