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RESEARCH ARTICLE

CLINICO-ETIOLOGICAL PROFILE AND IT'S RADIOLOGICAL CORRELATION IN PATIENTS WITH HYPOTHYROIDISM

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ABSTRACT

Background and Objectives: Hypothyroidism is a common but underdiagnosed disorder because of its nonspecific clinical presentation. The study was done to determine the etiological and clinical profile of the patients with hypothyroidism. **METHODS** A hospital based descriptive study was conducted in Department of Internal Medicine, Guru Gobind Singh Medical College and Hospital, Faridkot where 120 patients of age ≥ 18 years diagnosed as new cases of hypothyroidism and willing to give blood samples were included. They underwent thyroid ultrasound and nuclear scan and/or FNAC wherever required. HAMD scores were measured for all patients to determine the association of depression and its symptoms with hypothyroidism. **Results:** The mean age of the study patients were 43.37 ± 14.6 years with majority of the population (23.33%) in the age group of 41-50 years. The gender distribution showed female predominance with 85% females and 15% males. Primary thyroid disease were seen in majority 98(81.67%) patients, subclinical hypothyroidism was present in 20(16.67%) cases and 2 cases were of secondary hypothyroidism. Anti TPO and Anti TG antibodies were assessed where 48 cases (40%) and 12 cases (10%) were positive for them respectively. On USG we found that in majority 86(71.67%) of patients, USG neck finding was normal followed by diffusely bulky thyroid in 27(22.50%), solitary nodule in 6(5.00%) cases and single showing lingual thyroid. The radionucleotide uptake scans showed significant association with USG findings ($p < 0.0001$) USG findings were significantly associated with thyroid antibodies ($p < 0.0001$) such that Anti TPO antibodies(IU/mL) was positive in 100% of patients with bulky thyroid and Anti Tg antibody(IU/mL) was positive in 40.74% of patients with bulky thyroid. In our study on thyroid FNAC, 86(71.67%) were normal, 28(23.33%) had lymphocytic thyroiditis, 1 case had colloid nodule and 5(4.17%) cases were malignant. The findings of FNAC showed significant association with radionuclear scans as the uptake was decreased in malignant cases and lymphocytic thyroiditis. **Conclusion:** Hypothyroidism is increasing mainly among female population with rising autoimmune phenomena. The investigations comprising of thyroid profile, USG and FNAC holds importance for the diagnostic workup of the patients.

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INTRODUCTION

Thyroid disorders are the most commonly encountered disorders of endocrine system.⁽¹⁾ Hypothyroidism is a common health issue in India, as it is worldwide. The prevalence of overt hypothyroidism in the general population ranges from between 0.2% and 5.3% in Europe and 0.3% and 3.7% in the

USA, depending on the definition used and population studied.⁽²⁻⁴⁾ Prevalence of hypothyroidism in India is 11%. As compared to cities of coastal area (e.g. Mumbai, Goa, etc.), inland cities (e.g. Kolkata, Delhi, etc.) have a higher prevalence of hypothyroidism (11.7% vs 9.5%).⁽⁵⁾ There are various types and causes of hypothyroidism. Classification for hypothyroidism includes congenital and acquired, primary, secondary and tertiary hypothyroidism. Various causes of hypothyroidism are idiopathic, autoimmune, inflammatory, postpartum, drug induced, iatrogenic, iodine deficiency, etc.

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METHODS

The present study was conducted in Department of Internal Medicine, G.G.S. Medical College and Hospital, Faridkot on 120 patients. The study was carried out after approval from Institutional Ethics Committee. Patients with age <18years, pregnancy, hyperthyroidism were excluded from the study. TSH, FT₃, FT₄, anti-TPO and anti-thyroglobulin antibodies were tested using Chemiluminescent assay. Thyroid ultrasonography was performed using the Philips Affiniti 70 ultrasound system using a high-frequency sonography (using 7-13 MHz transducer) linear probe. A gamma camera (Philips XCT bright view) equipped with a parallel collimator and aperture 5mm or less in diameter was used for Tc-99m radionuclear uptake scan. FNAC was performed to assess the histopathology.

RESULTS

In the study, maximum patients 28 (23.33%) belonged to age group 41-50. Only 4 out of 120 (3.33%) patients were in age group of 18-20 years. Mean value of age (years) of patients was 43.37 ± 14.6 . Out of total 120 patients, 102 (85.00%) were females and 18 (15%) were males. mean value of systolic blood pressure (mmHg) was 131.28 ± 20.07 and diastolic blood pressure (mmHg) of patients was 83.47 ± 16.8 . The mean value of pulse (per minute) was 81.43 ± 18.75 . Mean body mass index was 25.04 ± 3.54 (kg/m²) with mean height (cm) and weight (kg) being 157.6 ± 4.2 and 62.12 ± 10.01 respectively. The mean value of the waist hip ratio was 1.01 ± 0.06 . The mean waist and hip circumference (in cm) was 97.88 ± 16.03 and 96.46 ± 11.6 respectively. The Mean value of haemoglobin (gm%), random blood sugar (mg/dL), serum sodium (mEq/L), of study subjects was 10.18 ± 2.21 , 119.08 ± 44.8 , 138.57 ± 6.11 respectively. the most common symptom was lethargy and generalized weakness that was found in 100 (83.3%) patients. The next most common symptoms were hair fall, dry skin and cold intolerance which was seen in 93 (77.5%), 59 (49.17%) and 59 (49.17%) patients respectively.

In the study, 98 (81.67%) had primary hypothyroidism. Subclinical hypothyroidism (SCH) was found in 20 (16.67%) patients whereas secondary hypothyroidism was present in only 2 (1.67%) patients. Majority of patients i.e. 114 (95%) TSH was high. Mean value of TSH (IU/mL) of patients was 17.07 ± 31.34 . The mean value of FT₄ (ng/dL) of study subjects was 0.57 ± 0.23 . Out of total patients, 74 (61.67%) patients had low FT₄ (ng/dL). Mean value of FT₃ (pg/mL) of study subjects was 1.98 ± 0.9 . In 90 (75.00%) patients, FT₃ was low. Mean value of anti-TPO antibodies (IU/mL) of study subjects was 142.95 ± 308.89 . Anti-TPO antibodies (IU/mL) was positive in 48 (40.00%) and negative in 72 (60.00%) of patients. Mean value of anti-Tg antibody (IU/mL) of study subjects was 54.46 ± 119.79 . Anti-Tg antibody (IU/mL) was positive in 12 (10.00%) and negative in 108 (90.00%) of patients. Out of 120 hypothyroid patients, 86 (71.67%) had normal ultrasound neck. 27 (22.50%) patients had diffusely bulky thyroid. 6 patients (5.00%) had solitary nodule. 1 patient had lingual thyroid tissue. Out of 120 hypothyroid patients, 90 (75.00%) had normal flow on thyroid color doppler. Reduced flow on color doppler was seen in 25 (20.83%) patients and increased flow was seen in 5 (4.17%) patients. In present study, 68.33% of patients had normal uptake followed by reduced uptake (27.50%). Increased uptake was seen in only 5 out of 120 patients (4.17%).

Mean value of radionuclear uptake (%) of study subjects was 1.68 ± 1.06 . Lymphocytic thyroiditis was seen in 28 (23.33%). Malignant thyroid disease and colloid nodule was seen in 6 (5%) out of total patients. Colloid nodule was seen in 16% of patients with nodular lesion on USG. Significant positive correlation was seen between anti TPO antibodies (IU/mL) with TSH (IU/mL) with correlation coefficient of 0.516 ($p < 0.0001$). Significant positive correlation was seen between anti Tgantibody (IU/mL) with TSH (IU/mL) with correlation coefficient of 0.439 ($p < 0.0001$). No significant association was seen in the distribution of TSH, FT₄ and FT₃ with USG neck. Significant association was seen in the distribution of anti TPO antibodies (IU/mL) with findings of thyroid USG in all the hypothyroid patients ($p < 0.0001$). Significant association was seen in the distribution of anti Tgantibody (IU/mL) with findings of thyroid USG in all the hypothyroid patients ($p < 0.0001$). No significant association was seen in the distribution of TSH, FT₄ and FT₃ with FNAC thyroid. Significant association was seen in the distribution of anti TPO antibodies (p value < 0.05) and Tg antibody (p value < 0.05) with findings of FNAC thyroid.

Significant association was seen in the distribution of radionuclear uptake (%) with USG neck. (p value < 0.05) Proportion of patients with reduced uptake was 100% of patients with lingual thyroid tissue, 88.89% of patients with diffusely bulky thyroid and 83.33% of patients with solitary nodule which was significantly higher as compared to 3.49% of patients with normal USG neck. Proportion of patients with normal uptake was 91.86% of patients with normal USG neck which was significantly higher as compared to 7.41% of patients with diffusely bulky thyroid, 0% of patients with lingual thyroid tissue and 16.67% of patients with solitary nodule. Proportion of patients with increased uptake were very few. Mean \pm SD of radionuclear uptake (%) in patients with normal uptake (2.14 ± 0.77) was highest followed by diffusely bulky thyroid (0.56 ± 0.79), solitary nodule (0.33 ± 0.5) and mean \pm SD of radionuclear uptake (%) in patients with lingual thyroid tissue (0.02 ± 0) was lowest. Significant association was seen in the distribution of radionuclear uptake (%) with FNAC thyroid. (p value < 0.05) Proportion of patients with reduced uptake was 100% of patients with malignant thyroid disease and 89.29% of patients with lymphocytic thyroiditis which was significantly higher as compared to 3.49% of patients with normal findings, 0% of patients with colloid nodule. Proportion of patients with normal uptake was 100% of patients with colloid nodule and 91.86% of patients with normal findings which was significantly higher as compared to 7.14% of patients with lymphocytic thyroiditis and 0% of patients with malignant thyroid disease. Proportion of patients with increased uptake were very few patients. Mean \pm SD of radionuclear uptake (%) in normal FNAC group (2.14 ± 0.78) was highest followed by colloid nodule (1.35 ± 0), lymphocytic thyroiditis (0.55 ± 0.77) and mean \pm SD of radionuclear uptake (%) in malignant thyroid disease (0.13 ± 0.07) was lowest. Amiodarone was the causative agent in 4 (3.33%) and lithium in 2 (1.67%) patients. Chest X-ray was normal in 110 (91.66%) patients. Other findings were cardiomegaly (3.33%), consolidation (1.6%) and pleural effusion (1.6%) respectively. In the present study, Normal ECG was seen in 92 (76.66%) of the patients. Sinus tachycardia (10.83%), sinus bradycardia (5%), atrial fibrillation (3.33%), LBBB (3.33%) and ST-T changes (1.66%) were the other findings respectively in decreasing order of frequency.

Table 1. Descriptive statistics of study subjects

Parameters	Mean \pm St dev	Median(IQR)
Mean age (years)	43.37 \pm 14.6 years	44.5(32-54.25)
Females (n)	102 (85.00%)	-
Males (n)	18 (15.00%)	-
Pulse rate (per minute)	81.43 \pm 18.75	78(69-96)
Systolic blood pressure(mmHg)	131.28 \pm 20.07	130(110-148)
Diastolic blood pressure(mmHg)	83.47 \pm 16.8	82(68-90)
Height(cm)	157.6 \pm 4.2	158(154-160.425)
Weight(kg)	62.12 \pm 10.01	61.2(54.6-68)
Body mass index(kg/m ²)	25.04 \pm 3.54	24.85(22.05-27.265)
Waist circumference(cm)	97.88 \pm 16.03	95.6(85.5-109.5)
Hip circumference(cm)	96.46 \pm 11.6	97(88.6-103.05)
Waist hip ratio	1.01 \pm 0.06	0.99(0.97-1.042)

Table 2. Descriptive statistics of investigations of study subjects

Investigations	Mean \pm Stdev	Median(IQR)	Range
Total leucocyte count(/UL)	7631.83 \pm 2858.39	7400(5677.5-8925)	2300-18200
Hemoglobin(gm%)	10.18 \pm 2.21	10.2(8.6-11.6)	4.6-14.7
Platelet count(/uL)	229658.33 \pm 116327.75	214000(144250-288000)	9000-560000
PTI(%)	95.34 \pm 5.95	100(86.6-100)	78.3-100
International normalized ratio	1.06 \pm 0.08	1(1-1.118)	1-1.5
Random blood sugar(mg/dL)	119.08 \pm 44.8	103(92.5-138)	55-326
Blood urea(mg/dL)	46.96 \pm 33.85	38(28-59.5)	10-268
Serum creatinine(mg/dL)	1.07 \pm 1.11	0.9(0.7-1.1)	0.1-10.1
Serum sodium(mEq/L)	138.57 \pm 6.11	139(136-142)	119-152
Serum potassium(mEq/L)	4.23 \pm 0.58	4.2(3.8-4.7)	3.1-5.9
Serum chloride(mEq/dL)	101.7 \pm 4.52	102(98-105)	89-114
Total bilirubin(mg/dL)	0.83 \pm 0.42	0.75(0.5-1)	0.3-2.8
Direct bilirubin(mg/dL)	0.26 \pm 0.24	0.2(0.1-0.3)	0.1-1.4
SGOT(IU/L)	56.4 \pm 45.71	44(31-65)	16-288
SGPT(IU/L)	58.08 \pm 49.71	45.5(26-67.25)	10-312
ALP(IU/L)	100.24 \pm 67.59	87(67-102)	34-454

Table 3. ECG and chest xray findings of study subjects

ECG	NUMBER OF PATIENTS	PERCENTAGE
NORMAL	92	76.66%
SINUS TACHYCARDIA	13	10.83%
SINUS BRADYCARDIA	6	5%
ST-T CHANGES	2	1.66%
LBBB	4	3.33%
ATRIAL FIBRILLATION	4	3.33%
CXR	NUMBER OF PATIENTS	PERCENTAGE
NORMAL	110	91.66%
PLEURAL EFFUSION	2	1.6%
CARDIOMEGALY	4	3.33%
CONSOLIDATION	2	1.6%

Table 4. Correlation of ft3, ft4 and tsh with anti tpo antibodies and anti tg antibody

Variables	FT3(pg/mL)	FT4(ng/dL)	TSH(IU/mL)
Anti TPO antibodies (IU/mL)			
Correlation coefficient	-0.083	-0.085	0.516
P value	0.369	0.353	<0.0001
Anti Tg antibody (IU/mL)			
Correlation coefficient	-0.111	-0.168	0.439
P value	0.228	0.067	<0.0001

Spearman rank correlation coefficient

The most common comorbidity associated with hypothyroidism is hypertension in this study which accounted for 30 (25%) of total patients. Diabetes (15.83%), neuropathy (14.16%), valvular heart disease (5%) and obesity (4.16%) were the next most common associated comorbidities.

DISCUSSION

In the present study, the mean age of patients was 43.37 \pm 14.6 years with majority of the population (23.33%) in the age group of 41-50 years. The findings were in line with the previous study by Sethi B et al, who reported a mean age of

Table 5. Association of Thyroid Profile With Finding of Thyroid Ultrasound

Thyroid profile	Normal (n=86)	Diffusely bulky thyroid (n=27)	Lingual thyroid tissue (n=1)	Solitary nodule (n=6)	Total	P value	Test performed
FT3 (pg/mL)							
<2.5 (Low FT3)	62 (72.09%)	23 (85.19%)	1 (100%)	4 (66.67%)	90 (75%)	0.516	Fisher Exact test
2.5-3.9 (Normal FT3)	24 (27.91%)	4 (14.81%)	0 (0%)	2 (33.33%)	30 (25%)		
FT4 (ng/dL)							
<0.61 (Low FT4)	50 (58.14%)	19 (70.37%)	0 (0%)	5 (83.33%)	74 (61.67%)	0.268	Fisher Exact test
0.61-1.12 (Normal FT4)	36 (41.86%)	8 (29.63%)	1 (100%)	1 (16.67%)	46 (38.33%)		
TSH (IU/mL)							
<0.35 (Low TSH)	2 (2.33%)	0 (0%)	0 (0%)	0 (0%)	2 (1.67%)	0.104	Fisher Exact test
0.35-5.50 (Normal TSH)	3 (3.49%)	0 (0%)	1 (100%)	0 (0%)	4 (3.33%)		
>5.50 (High TSH)	81 (94.19%)	27 (100%)	0 (0%)	6 (100%)	114 (95%)		
Anti TPO antibodies (IU/mL)							
Negative	67 (77.91%)	0 (0%)	1 (100%)	4 (66.67%)	72 (60%)	<.0001	Fisher Exact test
Positive	19 (22.09%)	27 (100%)	0 (0%)	2 (33.33%)	48 (40%)		
Anti Tg antibody (IU/mL)							
Negative	86 (100%)	16 (59.26%)	1 (100%)	5 (83.33%)	108 (90%)	<.0001	Fisher Exact test
Positive	0 (0%)	11 (40.74%)	0 (0%)	1 (16.67%)	12 (10%)		

Table 6. Association of thyroid profile with fnac thyroid

Thyroid profile	Normal (n=86)	Colloid nodule (n=1)	Lymphocytic thyroiditis (n=28)	Malignant thyroid disease (n=5)	Total	P value	Test performed
FT3 (pg/mL)							
<2.5 (Low FT3)	62 (72.09%)	1 (100%)	24 (85.71%)	3 (60%)	90 (75%)	0.373	Fisher Exact test
2.5-3.9 (Normal FT3)	24 (27.91%)	0 (0%)	4 (14.29%)	2 (40%)	30 (25%)		
FT4 (ng/dL)							
<0.61 (Low FT4)	49 (56.98%)	1 (100%)	20 (71.43%)	4 (80%)	74 (61.67%)	0.342	Fisher Exact test
0.61-1.12 (Normal FT4)	37 (43.02%)	0 (0%)	8 (28.57%)	1 (20%)	46 (38.33%)		
TSH (IU/mL)							
<0.35 (Low TSH)	2 (2.33%)	0 (0%)	0 (0%)	0 (0%)	2 (1.67%)	0.822	Fisher Exact test
0.35-5.50 (Normal TSH)	4 (4.65%)	0 (0%)	0 (0%)	0 (0%)	4 (3.33%)		
>5.50 (High TSH)	80 (93.02%)	1 (100%)	28 (100%)	5 (100%)	114 (95%)		
Anti TPO antibodies (IU/mL)							
Negative	68 (79.07%)	1 (100%)	0 (0%)	3 (60%)	72 (60%)	<.0001	Fisher Exact test
Positive	18 (20.93%)	0 (0%)	28 (100%)	2 (40%)	48 (40%)		
Anti Tg antibody (IU/mL)							
Negative	86 (100%)	1 (100%)	17 (60.71%)	4 (80%)	108 (90%)	<.0001	Fisher Exact test
Positive	0 (0%)	0 (0%)	11 (39.29%)	1 (20%)	12 (10%)		

41.1 ± 14.01 years and Darshan SM et al who found that majority of the patients were middle aged (51.1% in 31-50 years of age group).^(6,7) A recent study from the Central India had also reported a higher prevalence rate of hypothyroidism (45%–55%) in the age group of 19–45 years.⁽⁸⁾ Similar results were also observed in other studies by Saha PK et al and Vanderpump MPJ et al.^(9,10) The gender distribution in this study showed female predominance with 85% females and 15% males. The female predominance has been seen in the previous thyroid registry where out of the 1499 patients, 1061 (70.78%) were women and 438 (29.22%) were men.⁽⁷⁾ Even in the study conducted in Puducherry, most of the hypothyroid patients (168/213) were females, giving a female: male ratio of approximately 3.4:1.⁽⁶⁾

The reason may be linked to female hormones, since estrogen dominance has been implicated as a contributing factor.⁽¹¹⁾ Subclinical hypothyroidism was present in 20(16.67%) cases in our study. Overall, the prevalence of SCH ranges between 4% and 15% worldwide.^(12,13) The SCH cases in our study were higher than worldwide prevalence. Even the reported prevalence of SCH in Indian subcontinent seems to be lower than reported in our study. As per the epidemiology study conducted by Unnikrishnan et al. in eight cities of India, the prevalence of subclinical hypothyroidism (SCH), a mild thyroid failure, was found to be 8.02% which was less than our study.⁽¹²⁾ In Sethi B et al registry⁽⁷⁾, the percentage of patients with SCH was (11.8%) (n = 291) among those in whom T4 levels were assessed, and even in various other

Table 7. Association of tc 99m radionuclear uptake (%) with usg neck

Radionuclear uptake (%)	Normal (n=86)	Diffusely bulky thyroid (n=27)	Lingual thyroid tissue (n=1)	Solitary nodule (n=6)	Total	P value	Test performed
Reduced uptake	3 (3.49%)	24 (88.89%)	1 (100%)	5 (83.33%)	33 (27.50%)	< .0001	Fisher Exact test
Normal uptake	79 (91.86%)	2 (7.41%)	0 (0%)	1 (16.67%)	82 (68.33%)		
Increased uptake	4 (4.65%)	1 (3.70%)	0 (0%)	0 (0%)	5 (4.17%)		
Total	86 (100%)	27 (100%)	1 (100%)	6 (100%)	120 (100%)		

Table 8. Association of radionuclear uptake (%) with fnac thyroid

Radionuclear uptake(%)	Normal (n=86)	Colloid nodule (n=1)	Lymphocytic thyroiditis (n=28)	Malignant thyroid disease (n=5)	Total	P value	Test performed
Reduced uptake	3 (3.49%)	0 (0%)	25 (89.29%)	5 (100%)	33 (27.50%)	< .0001	Fisher Exact test
Normal uptake	79 (91.86%)	1 (100%)	2 (7.14%)	0 (0%)	82 (68.33%)		
Increased uptake	4 (4.65%)	0 (0%)	1 (3.57%)	0 (0%)	5 (4.17%)		
Total	86 (100%)	1 (100%)	28 (100%)	5 (100%)	120 (100%)		

Table 9. Symptoms of patients with hypothyroidism

Symptoms	Number of patients	Percentage
Hair fall	93	77.50%
Dry skin	59	49.17%
Madarosis	34	28.33%
Menstrual disturbance	27	26.47%
GI symptoms	31	25.83%
Weight gain	23	19.17%
Lethargy and generalized weakness	100	83.3%
Cold intolerance	59	49.17%
Hoarseness of voice	5	4.16%
Shortness of breath	7	5.83%
Behavioral changes	6	5%

Table 10. Associated comorbidities with hypothyroidism

COMORBIDITIES	NUMBER OF PATIENTS	PERCENTAGE
Hypertension	30	25%
Diabetes Mellitus	19	15.83%
Neuropathy	17	14.16%
Valvular Heart Disease	6	5%
Obesity	5	4.16%
Ascites	2	1.66%
Pleural Effusion	2	1.66%
Pneumonia	2	1.66%
ILD	2	1.66%
Cerebrovascular Accident	1	0.8%

epidemiological studies conducted in India, SCH has been reported to be 9.4% to 11.3%⁽¹³⁾ This difference might be because the true prevalence of SCH could not be determined in few of the studies as T4 values were not a part of the clinical assessment in majority of patients (n = 1208). As seen in the study by Sethi B et al, TSH and T4 levels were available for only 291 patients at baseline and thus it may underestimate SCH.⁽⁷⁾ Primary hypothyroidism was seen in majority 98(81.67%) patients. The findings corroborated with Darshan SM et al, where primary hypothyroidism was found in most of the study participants (91%).⁽⁶⁾ In contrast to our study, in the study by Sethi B et al, very less patients (97 patients (6.47%)) had overt hypothyroidism, and 10 patients had inappropriate TSH secretion. The difference in the reported prevalence may be due to different cut-offs taken to classify hypothyroidism.⁽⁷⁾ In their study, the TSH values were considered low if the TSH level was <0.5 mU/L and high if the TSH level was >4.7 mU/L whereas we considered low TSH below 0.35 and high TSH above 5.5 mU/L.

Secondary hypothyroidism was also noted 2 cases where all the thyroid parameters (TSH, FT₃ and FT₄) were decreased. Disorders affecting either the pituitary gland or the hypothalamus cause secondary or central hypothyroidism.⁽⁷⁾ Anti-TPO and anti-Tg antibodies were assessed where 48 cases (40%) and 12 cases (10%) were positive for them respectively; thereby indicating auto-immune phenomenon. In a systematic review, the reported incidence of autoimmune hypothyroidism varied between 2.2/1,00,000/year (males) and 498.4/1,00,000/year (females). Higher incidence rates were found in women compared to men for all types of autoimmune thyroid disease.⁽³⁾ Since hypothyroidism is more common in females and the prevalence of thyroid autoantibodies is also more in females, it becomes all the more important to assess thyroid autoantibodies in all cases of hypothyroidism to rule out the autoimmune phenomena. Hemodynamic parameters taken into consideration in our study were systolic blood pressure (SBP), diastolic blood pressure (DBP) and pulse rate.

The mean SBP and DBP were 131.28 mm Hg and 83.47 mm Hg respectively. SaltikiK found the SBP and DBP of 119.7 ± 20.3 and 77.2 ± 12.3 mm Hg respectively in euthyroid population.⁽¹⁴⁾ However, In a study Saito et al. found a 3-fold higher prevalence of diastolic hypertension in hypothyroidism than in age-matched patients without thyroid disorder.⁽¹⁵⁾ The mean pulse rate in the study was 81.43 per minute. Grais IM in contrast found sinus bradycardia being a common finding in hypothyroidism.⁽¹⁶⁾ Anthropometric parameters were also taken into account during study. Mean body mass index in the study was 25.04 ± 3.54 (kg/m²) and waist circumference was 97.88 ± 16.03 (cm). Khare J in their study found in their study, the BMI and WC of 29.4 ± 6.1 and 110.7 ± 11.31 respectively.⁽¹⁷⁾ Various researchers have studied the effect of the thyroid hormones on body mass index (BMI), and it has been demonstrated that overt thyroid dysfunction affects body weight. Clinical hypothyroidism causes an increase in body weight, while hyperthyroidism reduces it.⁽¹⁸⁾ In their study, Dr. Rishabh Dixit et al found that the range of overweight i.e. 25-29.9 kg/m² was seen in 44 (34.37%) patients while 64 (50%) patients have BMI in range of moderate obesity i.e. 30-35 kg/m². 20 (15.63%) patients were having high obesity out of 128 total patients. In another study by Kumar H, BMI was ranging from 25-29.99 kg/m² in 9.3% individuals whereas 50% of patients with high TSH had BMI >30kg/m²^(19,20)

Symptoms and signs of patients with hypothyroidism were taken into consideration in the present study. The most common symptom was lethargy and generalized weakness seen in about 83.30% of the patients. This was followed in decreasing order by hair fall (77.50%) and dry skin (49.17%). Other symptoms were weight gain, menstrual disturbances, cold intolerance, shortness of breath, behavioural changes, hoarseness of voice, GI symptoms etc. These results were comparative to study by Dixit R done in 2015. Most common signs and symptoms noted in their study were anaemia, fatigue, weight gain, constipation, loss of libido, muscle cramps and cold intolerance in 73.43%, 70.3%, 65.62%, 63.28%, 42.96%, 40.62% and 37.5% cases respectively. Hoarseness of voice was seen on 7 (6.5%) patients out of 128 total patients out of which 1 was male and 7 were females.⁽¹⁹⁾ On USG we found that in majority 86(71.67%) of patients, USG neck findings were normal followed by diffusely bulky thyroid in 27(22.50%), solitary nodule in 6(5.00%) cases and single showing lingual thyroid. In study by Kumar A et al, out of 295 cases, the maximum number of thyroid cases that were investigated on USG was diagnosed as MNG (56.27%) of cases.⁽²¹⁾ Colloid goitre in a solitary nodule was diagnosed in 26.78% cases on USG thyroid. In their study, 293 out of 295 thyroid cases the swellings were palpable while in remaining two cases, only USG examination detected the thyroid swelling. 84.64% of thyroid cases were solitary on palpation but only 43.73% proved to be solitary on USG examination. On comparison of nodularity on clinical examination with USG thyroid examination, the Chi square value and p value was highly significant showing that USG thyroid was better in diagnosing STN cases than clinical examination. Even in our study, the radionucleotide uptake scans showed significant association with USG findings ($p < 0.0001$) as all cases with STN showed reduced uptake, with normal thyroid showing normal uptake and increased uptake in variable cases. This suggests that USG modality can be used as a screening modality in association with radionuclear scans in STN cases for determining their nature.⁽²²⁾

USG neck for thyroid status in our study yielded normal study in 71.67% of patients. 22.50% had diffusely bulky thyroid, 5.0% had solitary nodule whereas lingual thyroid was seen only 1 patient (0.83%) which was confirmed on radionuclear uptake scan. Dhadke SV et al found in their study, out of 93 hypothyroid patients, 10 had diffuse enlargement of gland whereas 2 patients had solitary nodule.⁽²³⁾ Besides, in our study, USG findings were significantly associated with thyroid antibodies ($p < 0.0001$) such that anti-TPO antibodies(IU/mL) was positive in 100% of patients with bulky thyroid and anti-Tg antibody(IU/mL) was positive in 40.74% of patients with bulky thyroid. This suggested that presence of auto-antibodies may relate with bulky thyroid as seen on USG. In our study on thyroid FNAC, 86 (71.67%) were normal, 28 (23.33%) had lymphocytic thyroiditis. Out of 6 nodular lesions, 16.66% cases had colloid nodule. 5 cases were malignant. This corroborated with doppler scans where malignant cases showed increased blood flow.

The findings of FNAC showed significant association with radionuclear scans as the uptake was decreased in malignant cases and lymphocytic thyroiditis. Interestingly we found that all cases of lymphocytic thyroiditis had positive anti-TPO antibodies indicating an autoimmune phenomena for lymphocytic infiltration of the thyroid, thus necessitating the role of thyroid antibodies evaluation. The association of lymphocytic thyroiditis and thyroid antibodies has been seen in previous studies by Handa et al, Gupta et al, and Sathiyamurthy et al.⁽²⁴⁻²⁶⁾ Various comorbidities, which presented along with hypothyroidism were also studied and it was found that the most common comorbidities associated with hypothyroidism were hypertension and diabetes which were 25% and 15.83% respectively. Other comorbidities associated were neuropathy, ILD, pneumonia, valvular heart disease, obesity, ascites and pleural effusion. Similar study conducted by Dhadke SV et al concluded that hypertension was associated in 21.5% patients.⁽²³⁾ ECG findings in the patients in our study were variable. Although 76.66% on patients had normal ECG, sinus tachycardia was found in 10.83% and sinus bradycardia was found in 5% of the patients. 3.33% patients had LBBB and atrial fibrillation in each group, whereas ST-T changes were seen in only 1.66% of patients. These results were in contrast to the finding of study done by Dhadke SV et al in 2014 where bradycardia was seen 23.65% of the patients. Low voltage complexes (15.05%), ST-T changes (13.98%), sinus tachycardia (2.15%) and atrial fibrillation (2.15%) were the other findings in that study.⁽²³⁾

Tc99m thyroid radio-nuclear uptake scan yielded that the proportion of patients with reduced uptake was 100% of patients with malignant thyroid disease and 89.29% of patients with lymphocytic thyroiditis which was significantly higher as compared to 3.49% of patients with benign thyroid disease, 0% of patients with colloid nodule. Sudaram FX found that out of total nodules, 14 cancerous nodules were cold on the Tc99m pertechnetate scan, whereas with Tc99m MIBI 11 were warm and 3 were either cold or hot nodules. Of the 44 benign lesions, 18 were cold, 9 were warm and 17 were hot nodules. In those 131 patients who had FNAC, the cytology was reported as benign in 120 of the nodules and malignant in 11.⁽²⁷⁾ Charles M and coworkers described the radionuclear uptake patterns of lymphocytic thyroiditis, where in early phases there is increased uptake and in later stages there is decreased uptake on radionuclear scan.⁽²⁸⁾

Conclusion

Hypothyroidism is common endocrine disorder with increasing prevalence. It is more common in middle age group females. Autoimmune cause is one of the most important causes, with anti-TPO and anti-Tg antibodies being common. Hypothyroidism can have variable ultrasound and radionuclear uptake presentation. Patients with hypothyroidism can have psychiatric comorbidity in the form of depression.

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