



ORIGINAL RESEARCH PAPER

Pathology

THE PREVALENCE OF THYROID HORMONES DISORDER IN TERTIARY CARE CENTRE, GWALIOR WITH SPECIAL REFERENCE TO ANTENATAL CASES

KEY WORDS: Prevalence, Thyroid hormone disorder, Antenatal cases, Hypothyroidism, Hyperthyroidism

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ABSTRACT

Multiple studies had been conducted world wide on the prevalence of thyroid hormone disorder in past and recent years. Hypothyroidism during pregnancy is also very common affecting both mother and foetus. A prospective study is conducted in department of pathology, GRMC Gwalior including 1554 patient with symptoms and previous history and analysed by SNIBE MAGLUMI series fully automated ChemiluminescenceImmunoassay analyzer (Clia) for the quantitative determination of thyroid hormone profile. Out of 1554 patients, prevalence of thyroid hormone disorders discussed separately in 1271 cases and 283 antenatal cases. Among 1271 patients, prevalence of thyroid hormone disorder is 32.9% where as 67.1% were euthyroid with higher prevalence of hypothyroidism (26.3%) than hyperthyroidism (6.6%). Females are affected more than male (7:1) and most commonly affected age group is 20 to 39 years. Prevalence of primary, secondary and subclinical hypothyroidism were 4.16%, 2.04% and 20.06% respectively where as in case of hyperthyroidism were 0.94%. 5.43% and 0.23% respectively. Antenatal cases shows 33.6% prevalence of hypothyroidism and 0.4% prevalence of hyperthyroidism. Women in first trimester shows maximum prevalence of 15.9% including 15.55% hypothyroidism and 0.35% hyperthyroidism followed by 9.9% and 8.13% prevalence of hypothyroidism in second and third trimester respectively. Our study conclude that prevalence of thyroid hormone disorders are increasing with recent advances and time and further evaluation is needed to rule out the cause behind increasing trends.

INTRODUCTION

Thyroid is an important endocrine gland, which secretes hormone thyroxine (T3 and T4), which control basal metabolic rate and body growth¹.

Thyroid disorders are, arguably, second common endocrine disorders worldwide after diabetes. Multiple recent studies are conducted in different parts of world and India; 42 million people in India suffer from thyroid hormone disorder².

Hypothyroidism during pregnancy has an adverse effect on both mother and child. Children born to untreated or undertreated mothers have profound effect on future intellectual development.³ Pregnancy has a profound physiological impact on the thyroid gland and thyroid function. During pregnancy, the thyroid gland increases in size by 10% in iodine sufficient areas and to a greater extent in iodine deficiency areas.⁴ Production of thyroid hormones and iodine requirement both increases by approximately 50% during pregnancy as part of physiology.⁵

Thyroid disorder may be overlooked in pregnancy because of nonspecific symptoms and hyper metabolic state of pregnancy. Physiological changes of pregnancy can stimulate thyroid disease. Prevalence of thyroid disorder during pregnancy has a wide geographic variation. Western literature shows a prevalence of hypothyroidism in pregnancy of 2.5% and hyperthyroidism in pregnancy has prevalence of 0.1 to 0.4%.⁶

Clinical features of overt hyper and hypothyroidism are well known, subclinical thyroid conditions have subtle clinical manifestations and may mimic other diseases.. In view of adverse maternal and fetal outcome in pregnant women with thyroid disorder and obvious benefits of early diagnosis and treatment, some expert panels all around the world have

suggested routine thyroid function screening of all pregnant women.

Thyroid hormone disorders are usually associated with multiple co morbidities: like dislipidemia, infertility, pregnancy outcomes associated with neonatal hypothyroidism, hypertension and neuropsychiatry disorders⁷.

Subjects Will Be Classified By Using Following Definition:

- Primary Hypothyroidism- TSH > 4.5 µIU/ml and T4 < 5.1 ng/ml or T3 < 0.69 ng/ml.
- Subclinical Hypothyroidism- TSH > 4.5 µIU/ml and normal T4 and T3.
- Secondary Hypothyroidism- T4 < 5.1 ng/ml or T3 < 0.69 ng/ml and a TSH level that is not appropriately elevated.
- Hyperthyroidism- TSH < 0.3 µIU/ml and T4 > 127 ng/ml or T3 > 2.15 ng/ml
- Subclinical Hyperthyroidism- TSH < 0.3 µIU/ml and normal T3 and normal T4.
- Secondary Hyperthyroidism- T4 > 127 ng/ml or T3 > 2.15 ng/ml and TSH level that is not appropriately suppressed.

TSH Values In Pregnancy¹⁰:-

First trimester(12weeks), T3- 97 to 149 ng per dL, T4- 6.5 to 10.1 mcg per dL, TSH- 0.1 to 2.5 mIU per L.

Second trimester(13 to 24 weeks), T3-117 to 169 ng per dL, T4- 7.5 to 10.3 mcg per dL. TSH- 0.2 to 3.0 mIU per L.

Third trimester(>24 weeks), T3-123 to 162 ng per dL, T4- 6.3 to 9.7 mcg per dL. TSH- 0.3 to 3.0 mIU per L.

MATERIAL AND METHODS

It's prospective observational study conducted by

Department of Pathology, Gajra Raja Medical College and J. A. group of Hospitals, Gwalior (M.P.) from November 2019 to June 2021. In Sample size calculation for 95% confidence interval and significance level $\alpha=5\%$, $P=15\%$ (9), $Q=85\%$, allowable error= 2%, required sample size was 1225. Inclusion criteria of adequate sample (minimum 300 μ l of serum) must be clean and clear with appropriate data and clinical history and exclusion criteria of inadequate Sample, Without data and clinical history, Lipemic, Hemolysed sample and patient under gone to any kind of surgery for thyroid.

The serum sample of all the patient with suspicion of thyroid dysfunction will be subjected to thyroid profile (serum Total T4, Total T3 and TSH) using **SNIBE MAGLUMI series fully** automated Chemiluminescence Immunoassay analyzer (CLIA) for the quantitative determination of thyroid hormone profile. Normal values of different parameters of thyroid profile from the laboratories reference values : Total T3 - 0.69-2.15 ng/ml, Total T4 - 52-127 ng/ml, TSH- 0.3-4.5 μ IU/ml.

OBSERVATION AND RESULT

Present study was conducted at tertiary care center, Gajra raja Medical College Gwalior. Total 1554 cases were taken and divided into two groups because we were also looking for the prevalence of thyroid hormone disorder in antenatal cases. Out of 1554 cases, prevalence of thyroid hormones disorder discussed separately in 1271 cases and 283 Antenatal cases.

Among 1271 patients, 1080 were female and 191 were male patient. Out of 1271 suspected thyroid hormone disorder cases , T3, T4 and TSH values of 853 (M-139, F-714) cases were within range so categorized as euthyroid, constitute 67.1% and 334 (M-43, F-291) cases with raised TSH values categorized as hypothyroidism constitute 26.3% and 84 (M-09, F-75) cases with low TSH level categorized as hyperthyroidism constitute 6.6%.

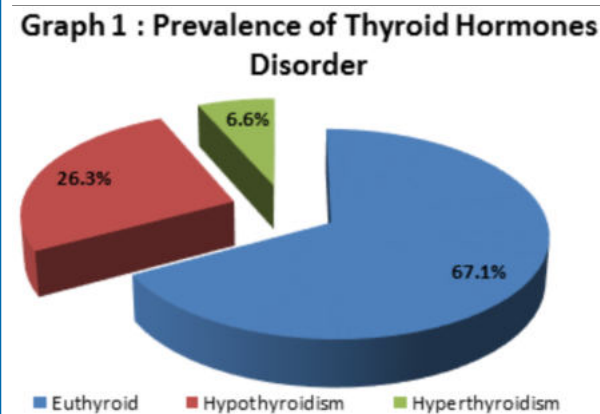


Table No 2: Prevalence Of Thyroid Hormone Disorder In Male And Female

Sex	Euthyroid	Hypothyroidism	Hyperthyroidism	Total	P-value	Chi ²
Female	714 (56.18%)	291 (22.90%)	75 (05.90%)	1080 (85%)	0.017	3.510
Male	139 (10.94%)	43 (03.38%)	09 (0.71%)	191 (15%)		

Table No 1: Prevalence Of Thyroid Hormone Disorder With Gender Wise Distribution

Category	All subjects (1271) N(%)	Gender	
		Males(52)	Females(366)
Primary hypothyroid	53 (4.16%)	09 (0.71%)	44(3.46%)
Secondary hypothyroidism	26 (2.04%)	07 (0.55%)	19(1.49%)
Subclinical hypothyroidism	255 (20.06%)	27 (2.12%)	228(17.94%)

Primary hyperthyroidism	12 (0.94%)	02(0.16%)	10(0.79%)
Secondary hyperthyroidism	69 (5.43%)	07(0.55%)	62(4.88%)
Subclinical hyperthyroidism	03(0.23%)	00	03(0.24%)
Total	32.9%	04.09%	28.80%

Hypothyroidism:

Total 334 patients were detected with hypothyroidism with female predominance of 291 (22.89%, 291/1271)) female cases. This study also clearly showing highest prevalence of subclinical hypothyroidism constitute 20.06% among total hypothyroidism cases.

Hyperthyroidism:

84 cases diagnosed with hyperthyroidism with female predominance of 05.91%.

All cases with suspected thyroid hormone disorders were subdivided into four categories to determine the prevalence of thyroid hormone disorder in various age group including 01 to 19 years, 20 to 39 years, 40 to 60 years and more than 60 years.

Table No 2: Prevalence Of Thyroid Hormone Disorder In Various Age Groups.

Category	All subjects (1271) N(%)	Age group			
		01 to 19 Years (271)	20 to 39 Years (628)	40 to 60 years (296)	>60 years (42)
Primary hypothyroidism	53 (4.16%)	18 (1.42%)	25 (01.97%)	07 (0.55%)	03 (0.24%)
Secondary hypothyroidism	26 (2.04%)	04 (0.31%)	13 (01.34%)	06 (0.47%)	02 (0.16%)
Subclinical hypothyroidism	255 (20.06%)	33 (02.60%)	124 (09.76%)	82 (06.45%)	13 (01.02%)
Primary hyperthyroidism	12 (0.94%)	01 (0.078%)	04 (0.31%)	05 (0.39%)	01 (0.079%)
Secondary hyperthyroidism	69 (5.43%)	31 (02.44%)	31 (02.44%)	02 (0.16%)	00
Subclinical hyperthyroidism	03 (0.23%)	01 (0.078%)	01 (0.079%)	01 (0.079%)	00
Total	418 (32.90%)	88 (06.92%)	198 (15.58%)	103 (08.10%)	19 (01.50%)

01 to 19 years age group, showing higher prevalence of 04.33% hypothyroidism (55,M-12,F-43) than 02.60% (33, M-08,F-25) prevalence of hyperthyroidism with female predominance.

There is higher prevalence of subclinical hypothyroidism (02.60%) followed by secondary hyperthyroidism (2.44%).

20 to 39 year age group is the largest group showing 15.58% prevalence with higher prevalence of 12.75% (162, M-10, F-152) hypothyroidism than 02.83% (F-36) prevalence of hyperthyroidism with female predominance. They are also showing highest prevalence of subclinical hypothyroidism (09.76%) followed by secondary hyperthyroidism (15.66%).

40 to 60 years age group is showing 08.10% prevalence of

thyroid hormone disorder with female predominance and 15.18% cases were euthyroid. Out of 296 cases 193 (15.18%, M-41, F-152) were euthyroid, 95 (07.47%, M-14, F-81) were hypothyroidism and 08 (0.63%, M-01, F-07) were hyperthyroidism. This group is the second largest group showing highest prevalence of subclinical hypothyroidism (06.45%) followed by primary hypothyroidism (0.55%), secondary hypothyroidism (0.47%).

Age group of more than 60 years is showing 01.49% prevalence while 01.81% patients are euthyroid. In this group, out of 42 case 23 (01.81%, M-09, F-14) were euthyroid, 18 (01.42%, M-06, F-12) were hypothyroidism and 01 (0.079, F-01) were hyperthyroidism. This group is showing highest prevalence of subclinical hypothyroidism (01.02%) followed by primary hypothyroidism (0.24%).

Table No 3: Thyroid Hormone Disorder In Infants

	EUTHYROID		HYPERTHYROIDISM											
	HYPOTHYROIDISM		Primary		Subclinical		Secondary							
	M	F	M	F	M	F	M	F						
Infants	12	12	00	00	01	02	00	01	00	01	00	00	00	05

We also include infants in this study, showing 0.79% prevalence of thyroid hormone disorders in infants with highest prevalence of secondary hyperthyroidism followed by subclinical hypothyroidism with female predominance in both cases.

Table No 4: Trimester Specific Prevalence Of Thyroid Hormone Disorder In Antenatal Cases

Trimester	No of cases	Euthyroid	Hypothyroidism	Hyperthyroidism
First	131 (46.29%)	86 (30.39%)	44 (15.55%)	01 (0.35%)
Second	83 (29.33%)	55 (19.43%)	28 (09.90%)	00
Third	69 (24.38%)	46 (16.25%)	23 (08.13%)	00
Total	283	187 (66.08%)	95 (33.57%)	01 (0.35%)

283 antenatal cases are included in our study out of which 187 (66.1%) were euthyroid, 95 (33.6%) were hypothyroidism and 01 (0.4%) case was of hyperthyroidism.

According to guideline of American thyroid association, American academy of family Physician 2014 and American college of Obstetrics and Gynecology (ACOG), most important parameter for thyroid hormone disorder is TSH.

Physicians should know the limitations of locally available assay methods. When preferred FT4 assay techniques are unavailable, a serum TSH level is a more accurate assessment of maternal thyroid status¹⁰.

Prevalence of thyroid hormone disorder in first trimester is 15.90% including 15.55% hypothyroidism and 0.35% hyperthyroidism with 46.29% euthyroid cases. In second trimester 09.90% prevalence of hypothyroidism and 19.43% euthyroid cases. In third trimester 08.13% prevalence of hypothyroidism and 16.25% euthyroid cases.

Maximum ANC cases registered in first trimester followed by second and third trimester.

DISCUSSION

This study is hospital based and conducted at tertiary care center Gwalior.

In my study, we found 32.9% prevalence of thyroid hormone

disorder where as 67.1% patient are in euthyroid category and it's also showing higher prevalence of hypothyroidism (26.3%).

Where as prevalence of thyroid hormone disorder reported by other hospital based study are 15% prevalence by Devika Tayal et al¹¹ (2012), 15.35% by Arindam Bose et al⁹ (2015), 15.73% by Lakshminarayana Gopaliah R et al¹³ (2016), 22.16% by Deokar et al¹², quite lower than our study. 33.66% by Yadav et al²¹. (2013) in western region of Nepal and 33.01% by Baruah MP et al¹⁴ (2019), supporting our study result and 49.8% by Alqahtani, S.A.M¹⁵ (2021), higher than our study result. It's evident that there is an increase in the prevalence of thyroid hormone disorders with the time.

It might be because of increased awareness about sign and symptoms of thyroid hormone disorder and easily available diagnostic facilities with early reporting.

20 to 39 years age group is the most affected age group with 15.58% prevalence of thyroid hormone disorder, followed by 40 to 60 years (8.10%), 01 to 19 years (6.92%) and more than 60 years (01.50%) similar to study in Kerala¹³.

In our study we found 26.26% prevalence of hypothyroidism, quite higher than Arindam et al⁹ (7.45% prevalence of overt hypothyroidism and 6.31% prevalence of subclinical hypothyroidism), Deokar et al¹² (13.68%) and Devika Tayal et al¹¹ (13.2%), Lakshminarayana GR et al¹³ (11.17%). Baruah MP et al¹⁴ reported 33.01% prevalence of hypothyroidism in Guwahati and Kolkata from eastern India reported (21.63%) prevalence of hypothyroidism²². Highest prevalence of 44.55%, reported by Alqahtani, S.A.M. in Saudi Arabia¹⁵.

In most of the prevalence study of thyroid hormone disorder in India and other parts of world showing high prevalence of hypothyroidism followed by subclinical hypothyroidism.

Similar to prevalence of thyroid hormone disorder in all age group, prevalence of hypothyroidism is also most affecting the 20 to 39 (12.75%) year age group followed by 40 to 60 year (07.47%) and 01 to 19 year (04.33%).

Subclinical hypothyroidism is the commonest thyroid hormone disorder 20.06% prevalence in our study, similar to Baruah MP et al¹⁴ (22.97%), where as 10.55% by Devika Tayal et al¹¹, 09.44% by Deokar et al¹², 07.15% by Lakshminarayana GR et al¹³, lower than our study and 39.55% by Alqahtani S.A.M¹⁵ which is higher than our study.

Subclinical hypothyroidism is also mostly prevalent in the age group of 20 to 39 years (9.76%) age group followed by 40 to 60 years (06.45%) and 01 to 19 years (2.60%).

Prevalence of primary hypothyroidism is 4.16% similar to Kerala (3.97%)¹³.

In our study population we found 6.6% prevalence of hyperthyroidism approximately similar to Deokar et al¹² (8.47%) and quite higher than the study results of Arindam Bose et al⁹ (1.79%), Devika et al¹¹ (1.22%), Lakshminarayana GR et al¹³ (4.37%). Higher prevalence of hyperthyroidism is also reported by Yadav NK et al²¹ from eastern region of Nepal (24.8% hyperthyroidism including 14.9% overt hyperthyroidism and 9.9% subclinical hyperthyroidism) and Rakesh Kumar Gupta et al²³ from central region of Nepal (23.09% prevalence of total hyperthyroidism including both overt hyperthyroidism (12.65%) and subclinical hyperthyroidism (10.44%).

In our study we found 5.43% prevalence of secondary hyperthyroidism and 1.17% hyperthyroidism including 0.94% primary hyperthyroidism and 0.23% subclinical hypothyroidism.

20 to 39 years of age group shows highest prevalence of hyperthyroidism followed by 01 to 19 years, 40 to 60 years age group.

Higher prevalence of subclinical hyperthyroidism by Yadav NK et al²¹ and Rakesh KG et al²³ explained by: the selection bias of a hospital-based study, the functional autonomy of thyroid in endemic goiter cases, the poorly monitored iodized salt supply program in Nepal - excessive iodized salt may also cause thyrotoxicosis.

Gomez et al²⁴. reported 58.2% had hyperthyroidism, 53.1% of which were T4 thyrotoxicosis, 12.5% T3 thyrotoxicosis and 34.4% had subclinical hyperthyroidism) and 8.2% of patients had iodine induced hyperthyroidism, similarly in our study we also found T3 and T4 based thyrotoxicosis constitute 5.43% prevalence of secondary hyperthyroidism.

Prevalence Of Thyroid Hormone Disorder In Antenatal Cases

In our study we found 33.6 % prevalence of hypothyroidism which is equivalent to Muzamil Hassan et al¹⁶ (34.22%), Wagh RV et al¹⁷(34%), Goel B et al¹⁹ (32.2%) where as Panda et al²⁰ found higher prevalence (48.36%) than our study. study conducted by Sangeeta Pehwa et al¹⁵ in Amritsar found 10% prevalence of thyroid hormone disorder including 8% hypothyroidism and 2% hyperthyroidism quite lower than our study.

Out of 283 cases,131 (46.29%) were in first trimester, 83(29.33%) in second trimester and 69(24.38%) in third trimester. In our study where as Goel B et al¹⁹ in Chandigarh found 66.6%women (n=402), 28.3% women (n=171) and 5.1% women (n=31) in 1st, 2nd and 3rd trimesters respectively and Panda et al²⁰ found (n=278, 65.0%), (n=146, 34.1%) and (n=4, 0.9%) women in their first trimester, second trimester and third trimester respectively. In our study enrollment in first trimester is on quite lower side where as higher enrollment were done in third trimester and equivalent to second trimester.

Prevalence of thyroid hormone disorder in first trimester is 15.90% including 15.55% hypothyroidism and 0.35% hyperthyroidism with 46.29% euthyroid cases. Dhanwal DK et al²⁵ found 14.3% prevalence of hypothyroidism similar to our study. Panda et al²⁰ found 30.14% prevalence in first trimester, whereas A similar study (2015) from Haryana²⁶ also reported 22.8% prevalence of hypothyroidism. Both are higher than our study result.

In second trimester we found 9.90% prevalence of hypothyroidism, lower than 17.29% prevalence of hypothyroidism in second trimester by panda et al²⁰.

In our study we also found 8.13% prevalence of hypothyroidism in third trimester higher than panda et al²⁰.

CONCLUSION

Our study clearly showing the high prevalence of hypothyroidism than hyperthyroidism. With increase in duration of time prevalence of thyroid hormone disorder is increasing. Commonest affected age group is between 20 to 39 years. We also found female predominance in thyroid hormone disorder with 7:1 Female to male ratio. Subclinical hypothyroidism is most common thyroid hormone disorder in study group which indicate more number of individual should be subjected for thyroid function test and must be evaluated for thyroid hormone disorder.

It also clearly shows increase in awareness about health with readily available diagnostic facilities and fast reporting system. Secondary hyperthyroidism shows higher prevalence with T3 and T4 thyrotoxicosis in our study which need further evaluation to know the the cause.

Prevalence of thyroid hormone disorder in antenatal cases is 34% with 33.6% prevalence of hypothyroidism and 0.4% prevalence of hyperthyroidism which is also increasing with increase in duration of time. Two separate prevalence studies were run in a single frame with the available facilities at our tertiary care center. Facilities of urinary iodine measurement, anti TPO antibody testing, estimation of free T3 and T4.

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