

A Prospective Study Of Trimester Specific Variability Of Thyroid Function Tests In Patients Attending Antenatal Clinic In Tertiary Health Care Centre Of Central India And Its Correlation With Thyroid Ultrasound And Color Doppler.

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I. Introduction

Pregnancy has a significant impact on thyroid physiology and thyroid disorders are among the most prevalent endocrine disorders. There are significant regional differences in the prevalence of thyroid problems during pregnancy. According to literature, the prevalence of hypothyroidism during pregnancy is 2.5%, while that of hyperthyroidism during pregnancy ranges from 0.1% to 0.4%(8). The two primary clinical types of hypothyroidism. Overt hypothyroidism is defined by an elevated serum TSH and subnormal free thyroxine (FT4), while subclinical hypothyroidism is characterised by an elevated serum TSH and normal free thyroxine (FT4). Cases of subclinical hypothyroidism, affects 2.3% of pregnant women, overt hypothyroidism is detected in 0.2% of cases(7). Numerous outcomes for the mother and the foetus are impacted by maternal thyroid problems. Preterm labour, abruptio placenta, abortion, and pre-eclampsia are the main obstetric complications, whereas prematurity, low birth weight, stillbirth, and perinatal mortality are the main foetal issues. Untreated mothers have a significant impact on their offspring's future intellectual development. Children born to hypothyroid moms have experienced negative prenatal and postnatal outcomes, including attention deficit and hyperactivity syndrome(8). There might be foetal growth retardation as a result of hyperthyroidism during pregnancy, which is primarily caused by Grave's disease.

Due to large number of physiologic alterations in thyroid functioning, the typical reference range of thyroid hormones in pregnant women has been the subject of numerous investigations. The ethnicity, geographic location, iodine status, rigor for selection of reference population and estimating method all affect these values, though(6). Thus, it is crucial to establish reference intervals for each trimester of pregnancy. Thyroid abnormalities should be diagnosed using these values during pregnancy. Thyroid levels for each trimester must be established for various populations around the world since reference intervals must be demographic, technique, and gestational age specific. There are few data on trimester-specific thyroid hormone levels during pregnancy in India, and none from Madhya Pradesh.

The value of color Doppler sonography in thyroid disease continues to be a matter of debate. Over the past few years, several studies have proved unable to yield unequivocal results. Only a few studies concerning color Doppler sonography in patients with hypothyroidism have been published. The color Doppler pattern of intense hypervascularization of the thyroid gland formerly attributed only to the hyperthyroid state of active Graves' Disease can also be seen in hypothyroidism. Our data support the concept that the color flow appearance is not the result of stimulated thyroid hormone production, but a measure of the activity of an autoimmune process.

II. Methods

- Permission from the institutional ethics committee and university clearance was obtained.
- Meeting and rapport building with the study participants.
- All antenatal pregnant females coming in MYH antenatal OPD in their first trimester reporting to the Department of Obstetrics and Gynecology, MGM Medical College and MY hospital, Indore were included in this study.
- The patients were provided with the study information sheet and consent form and were explained about the relevant details about the study in a language best understood by them.
- Informed written consent was obtained after explaining about the purpose, nature and process of the study and then data collection was started.
- Prestructured, pretested proforma was used to collect details about the patients.

- Demographic profile, detailed history, risk factors, physical and obstetrics examination including general physical, abdominal and pelvic examination were noted.
- Investigation details such as complete haemogram, thyroid profile, viral markers, urine routine microscopy, USG, Ante-natal profile were also noted.
- The patients having deranged thyroid profile (S.TSH level- >2.5ug/dl) were sent for thyroid USG and colour doppler studies.
- These patients were followed up for 3 trimesters and thyroid profile along with thyroid ultrasound and color doppler was done every trimester.
- Antenatal and intra-natal details were noted.
- Maternal and foetal monitoring was performed according to standard guidelines.
- Deranges thyroid profile was correlated with changes in ultrasonography and colour doppler.
- Maternal and foetal outcome in terms of morbidity and mortality were noted.

DATA ANALYSIS

Data was collected and entered simultaneously in statistical package for social sciences (SPSS) version 23 and coded appropriately. The data was analysed keeping in view the aim and objectives of the study. Descriptive statistics were calculated to summarize the sample characteristics in terms of frequency and percentage. Graphs and Charts were made. Analytical and inferential analysis was done. Significant was set at standard 0.05.

ETHICAL CLEARANCE

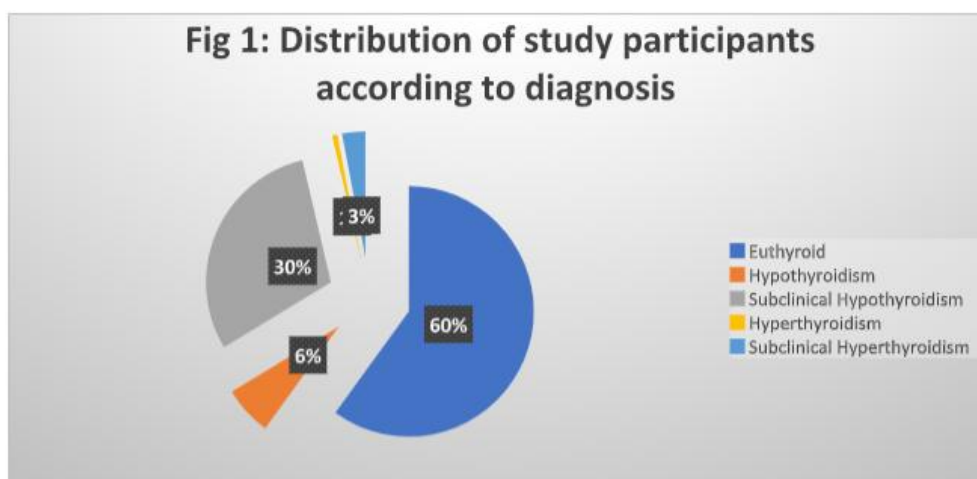
The research described was approved from the Ethical Committee of MGM Medical college, Indore and was conducted with approved guidance and regulations. Written informed consent was taken from the patient. All the study participants were explained in detail about the purpose of the study in their own language which they could understand.

III. Results And Observation

In this study, 60% of the study participants were Euthyroid, 30% of the participants were subclinical hypothyroid, 6.3% had Hypothyroidism, 3% had subclinical hyperthyroidism and only 0.7% of the participants were hyperthyroid.

Table 1: Distribution of study participants according to diagnosis

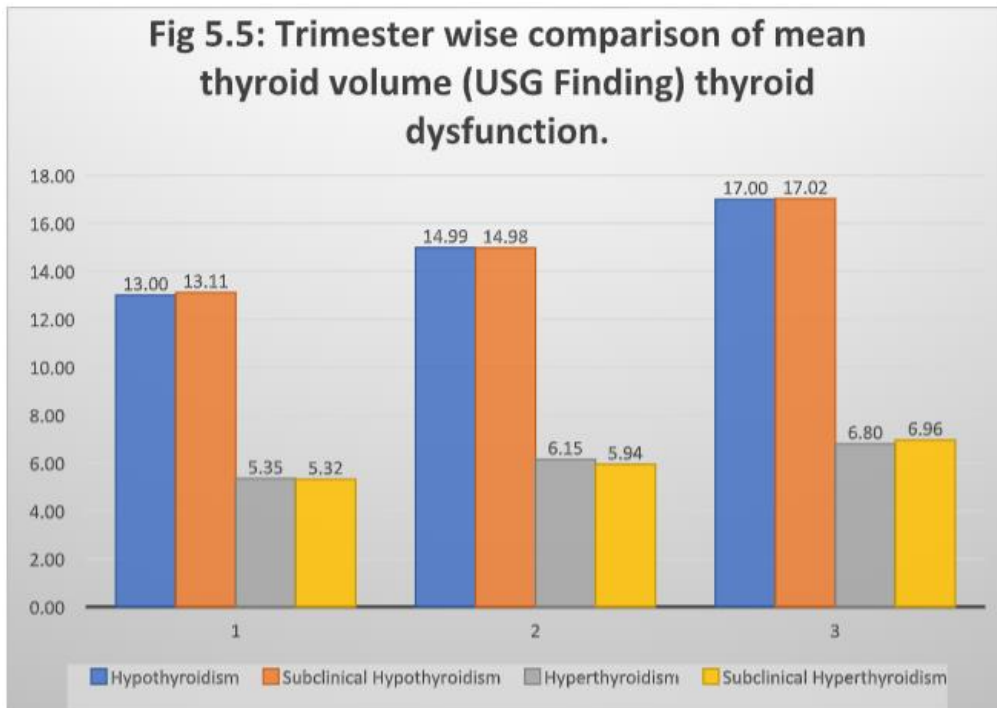
Diagnosis	Count	Column N %
Euthyroid	180	60.0%
Hypothyroidism	19	6.3%
Subclinical Hypothyroidism	90	30.0%
Hyperthyroidism	2	0.7%
Subclinical Hyperthyroidism	9	3.0%



The next table explains that in patients with hypothyroidism, mean volume of thyroid was 13.00 ± 0.64 , 14.99 ± 0.55 and 17.00 ± 0.61 in first, second and third trimester respectively. In patients with subclinical hypothyroidism, mean volume of thyroid was 13.11 ± 0.61 , 14.98 ± 0.59 and 17.02 ± 0.61 in first, second and third trimester respectively. Similarly in hyperthyroid patients, mean volume of thyroid was 5.35 ± 0.49 , 6.15 ± 0.21 and 6.80 ± 0.85 in first, second and third trimester respectively. Patients with subclinical hyperthyroidism, mean volume of thyroid was 5.32 ± 0.26 , 5.94 ± 0.27 and 6.96 ± 0.64 in first, second and third trimester respectively.

Table 2: Trimester wise comparison of mean thyroid volume (USG Finding) in thyroid dysfunction.

Thyroid dysfunction	First Trimester		Second Trimester		Third Trimester	
	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Hypothyroidism	13.00	.64	14.99	.55	17.00	.61
Subclinical Hypothyroidism	13.11	.61	14.98	.59	17.02	.61
Hyperthyroidism	5.35	.49	6.15	.21	6.80	.85
Subclinical Hyperthyroidism	5.32	.26	5.94	.27	6.96	.64
p Value	0.00		0.00		0.00	

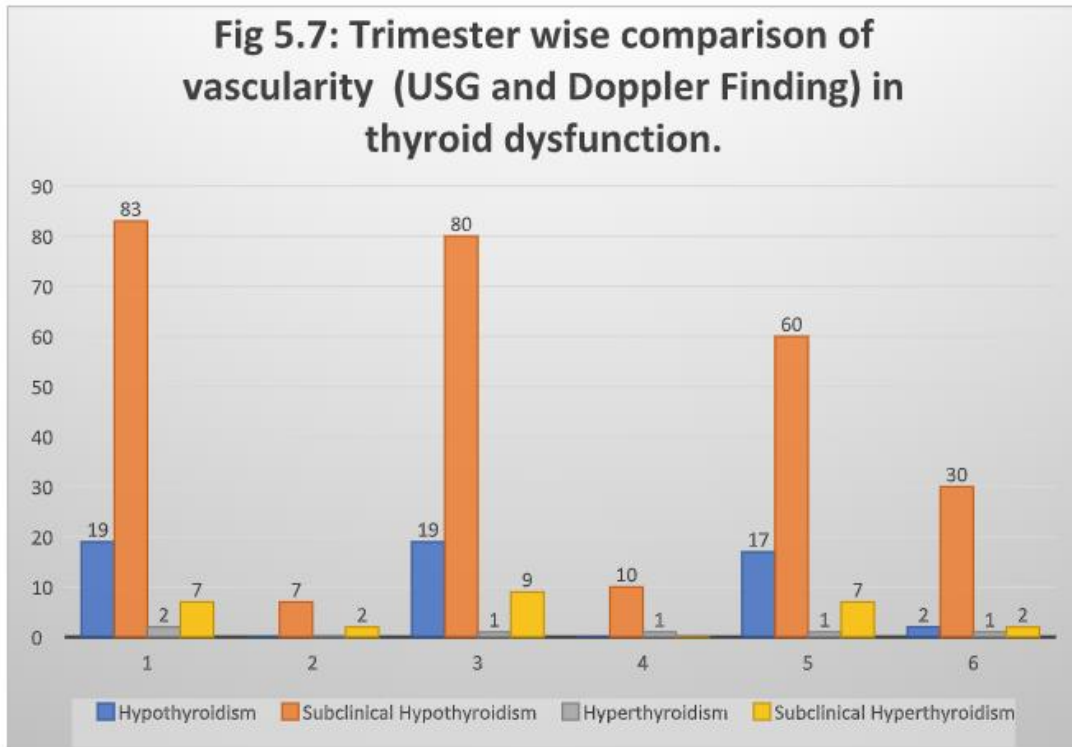


In this study, vascularity was present in 9 participants in first trimester, 11 participants in second trimester and 35 participants in third trimester. On comparison in Thyroid dysfunction it was found to be statistical significant in first and second trimesters.

Table 3: Trimester wise comparison of vascularity (USG and Doppler Finding) in Thyroid dysfunction

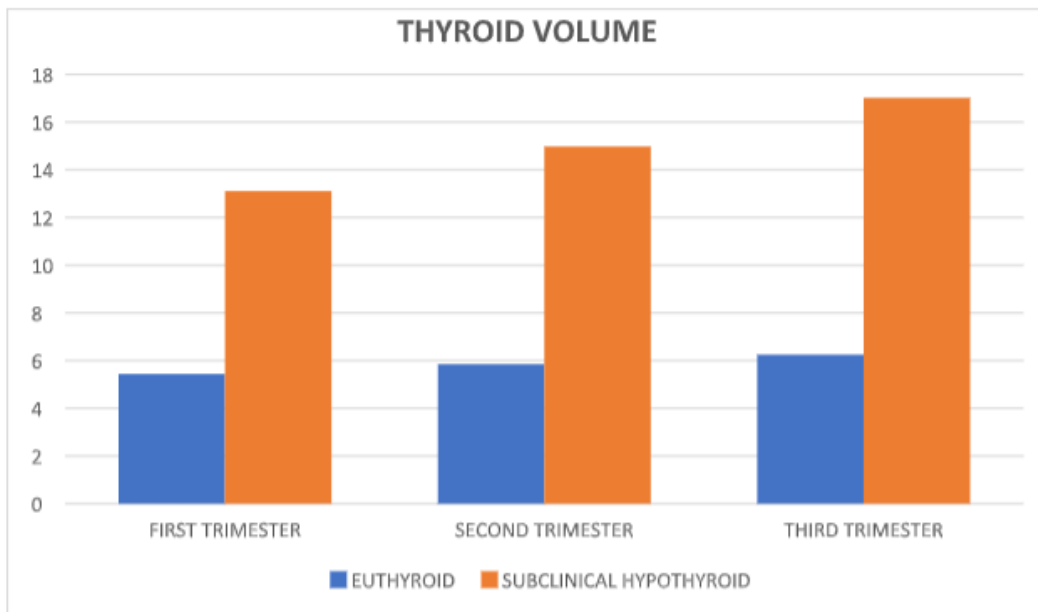
Trimester	Vascularity	Thyroid dysfunction				P Value
		Hypothyroidism	Subclinical Hypothyroidism	Hyperthyroidism	Subclinical Hyperthyroidism	
First Trimester	Normal	19	83	2	7	0.02
	Increased Vascularity	0	7	0	2	
Second Trimester	Normal	19	80	1	9	0.06
	Increased Vascularity	0	10	1	0	

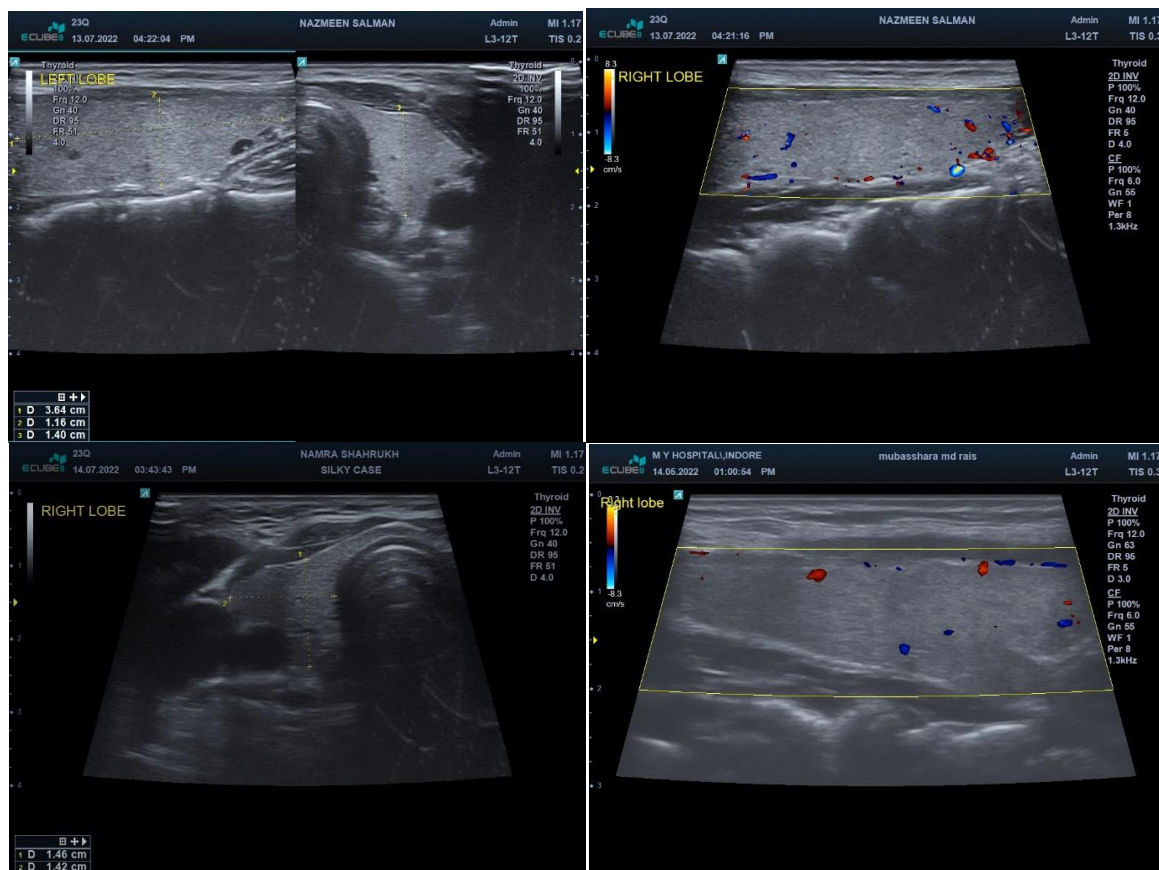
Third Trimester	Normal	17	60	1	7	0.02
	Increased Vascularity	2	30	1	2	



COMPARISON BETWEEN TRIMESTER SPECIFIC THYROID VOLUME IN EUTHYROID AND SUBCLINICAL HYPOTHYROID ANC PATIENTS.

We also compared our findings with the parallel research going on in the department of radiodiagnosis. Between the thyroid volume of euthyroid patients and patients with subclinical hypothyroidism.





IV. Discussion

Present study titled “A prospective study of trimester specific variability of thyroid function tests in patients attending antenatal clinic in tertiary health care center of central India” was conducted at Department of Obstetrics and Gynecology at MGM Medical College Indore. All antenatal pregnant females coming in MYH antenatal OPD getting their thyroid profile done in their first visit were included in the study. Keeping in mind objectives of the study statistical analysis was carried out. Salient results of the study are discussed below.

In present study majority of the women were **euthyroid (60%)**, followed by **30% of women with sub-clinical hypothyroidism and 6.3% with hypothyroidism**. Also **3% of the women had sub-clinical hyperthyroidism and 0.7% with hyperthyroidism**. Presence of goitrogens in diet, micronutrient deficiency such as selenium and iron deficiency may cause hypothyroidism. Poverty, insufficient iodine supplementation and fluorinated water may be the major cause for thyroid disorder among pregnant women.

USG and Doppler findings-

Although the standard procedures for determining thyroid size as part of a medical examination include visual inspection and palpation of the thyroid gland. However, the outcomes of such examinations are frequently unreliable and may result in a misdiagnosis; sonographic measurement of thyroid volume is more accurate. In present study, On USG and Doppler examination thyroid volume was found to be increasing with each trimester among antenatal women with hypothyroidism and this difference in mean volume was found to be statistically significant. We found that with each trimester the size of thyroid lobe along with isthmus increases, the highest value seen in third trimester. Higher mean volume of thyroid gland was observed in patients with sub-clinical hypothyroidism and hypothyroidism as compared with hyperthyroidism. In patients with hypothyroidism, mean volume of thyroid was 13.00 ± 0.64 , 14.99 ± 0.55 and 17.00 ± 0.61 in first, second and third trimester respectively. In patients with subclinical hypothyroidism, mean volume of thyroid was 13.11 ± 0.61 , 14.98 ± 0.59 and 17.02 ± 0.61 in first, second and third trimester respectively. **Thyroid volume in subclinical hypothyroidism is slightly higher than the hypothyroidism**. In patients with hyperthyroidism, thyroid volume was 5.35 ± 0.49 , 6.15 ± 0.21 and 6.80 ± 0.85 in first, second and third trimester respectively and in patients with subclinical hyperthyroidism 5.32 ± 0.49 , 5.94 ± 0.27 and 6.96 ± 0.64 in first, second and third trimester respectively. Among all patients included in this study, 10 patients had increased nodularity in first trimester, 11 patients had increased nodularity in second trimester and 26 patients had increased nodularity in third trimester. **Mostly patients with increased nodularity had subclinical hypothyroidism. Similar findings were found**

with increased vascularity also. Of all patients with increased vascularity in first trimester (9-patients), second trimester (11- patients) and third trimester (35-patients), most of the patients had subclinical hypothyroidism. Nodularity and vascularity were more in third trimester as compared to first trimester. Significant association was found between nodularity, Vascularity and deranged thyroid profile.

In the study conducted in the department of radiodiagnosis of MYH, Hospital, in which they divided females into 4 groups. Group 1 consisted of non-pregnant females and the rest three groups belonged to each trimester of pregnancy. All these females were clinically euthyroid and underwent thyroid USG. we found a significant increase in total thyroid volume with respect to trimester. Mean total thyroid volume in non-pregnant group, 1st trimester group, 2nd trimester group and in 3rd trimester group were 5.44 +/- 0.82ml, 5.85 +/- 0.64 ml, 6.25 +/- 0.67 ml and 7.24 +/- 1.16 ml respectively. This suggests that patients with subclinical hypothyroidism have almost double the volume of thyroid gland that euthyroid pregnant females. Also, nodularity was found to be increased in our study in pregnant females as compared to non-pregnant females.

V. Summary

- Majority of the pregnant women in the present study had sub-clinical hypothyroidism who were not on any medications.
- On USG and Doppler examination thyroid volume was found to be increasing with each trimester among antenatal women and this difference in mean volume was found to be statistically significant. The increase in thyroid volume was more in subclinical hypothyroid female than in hypothyroid female.
- We found that with each trimester the size of thyroid lobe along with isthmus increases, the highest value seen in third trimester.
- Nodularity and vascularity was more in third trimester as compared to first trimester and also significant association was found between nodularity/Vascularity and deranged thyroid profile.

VI. Conclusion

In our study sub-clinical hypothyroidism was the most common thyroid disorder found in pregnant women. Thyroid problems significantly alter metabolic and physiological processes, which in turn have an impact on the health of the mother and foetus. In subclinical hypothyroidism, pregnant women with TSH level >10m IU/L and women with TSH level 4-10m IU/L with positive TPOAb status must always be treated. Pregnant women with TSH level 4-10 m IU/L with TPOAb negative status can be considered for treatment. However there are limited studies on pregnant women with TSH between 2.5 to 4 m IU/L which was the basis of this research. Along with the usg and color doppler of thyroid we found that there are significant changes in the thyroid gland even in subclinical hypothyroid and therefore these patients must be considered for active medical management.

Therefore, it should be thought of universally screening expectant women for thyroid disorders, especially in a nation like India where there is a high prevalence of undetected thyroid disorders. Our study has a lot of advantages as it adds to the body of knowledge by reporting observed TSH, T4 and T3 readings in all three trimesters of pregnancy. The strong correlation between various fetomaternal unfavourable outcomes and hypothyroidism further emphasizes the need for routine thyroid function testing throughout pregnancy.

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