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Comparative analysis of targeted case findings and global thyroid screening in pregnancy

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Abstract
Background and Objectives: In order to support the necessity of regular prenatal thyroid screening. To quantify the prevalence of undiagnosed thyroid disorders. Examine the results of individuals diagnosed with thyroid problems who receive both sufficient and insufficient therapy.
Methods: Between May 2017 to April 2018, a total of 400 pregnant patients with singleton gestation were included in a study conducted at the Department of Community Medicine, Madha Medical College and Research Institute, Chennai, India. All participants in the study provided written consent. Patients diagnosed with hypothyroidism or hyperthyroidism were excluded from the analysis.
Results: Thyroid disorders affect 15.7% of the population. The 95% confidence interval (CI) suggests that the occurrence rate may vary between 13.21% and 16.79%. Additionally, it may be stated that 1 in 7 women who were surveyed experienced abnormal thyroid functioning.
Conclusion: This study suggests that standard thyroid screening, which fails to detect many individuals, is significantly more desirable than focused case detection. Participants exhibiting an aberrant thyroid profile experienced a higher incidence of complications compared to those with a normal thyroid profile. Therefore, in a country with a high incidence of thyroid cancer, it is imperative to advocate for extensive screening.

Keywords: Thyroid, pregnancy, TSH, FT3, FT4

Introduction
In recent years, there has been a growing focus on the significance of the thyroid gland and the consequences of thyroid diseases on the growth of both the fetus and the mother. Thyroid disorders associated with pregnancy rank as the second most prevalent endocrinological condition. The prevalence of hypothyroidism during pregnancy exhibits significant regional variations. The rates in the Western regions may reach as low as 2.5%, whereas in India they might reach as high as 11% [1, 2, 3].
Routine thyroid screening has been advocated by expert committees due to the adverse impact of maternal thyroid problems on offspring and the apparent advantages associated with therapy. On the other hand, the clinical practice recommendations of the Endocrine Society advocate for a case-finding approach, whereby only women who are potentially at risk undergo testing. Individuals who have a personal or familial medical condition, such as hypothyroidism, type 1 diabetes mellitus, or any other, are encompassed in this group [4, 5, 6].
In their recent analysis, Dhanwal *et al*. identified a notable prevalence of hypothyroidism. 14.3% Given these findings, I embarked on a mission to ascertain whether high-risk screening provides greater benefits to our nation compared to conventional screening methods. Existing research indicates that subclinical hypothyroidism is linked to several negative consequences for both the mother and child, such as spontaneous miscarriage, high blood pressure, sudden cessation of pregnancy, premature birth, and stunted cognitive and psychomotor growth [7, 8, 9].
The selection of criteria and threshold, along with the size of the population being screened, have an impact on both the screening yield and value. Hence, it is imperative to adjust the threshold in order to accommodate trimester-specific data. If the mother experiences hypothyroidism in the first trimester of pregnancy, it might adversely affect the embryo's brain development. Treatment after the first trimester is ineffective in reversing neurodevelopmental delay. Consequently, it is crucial to conduct universal screening and initiate suitable treatment at that stage to prevent these issues.

The thyroid hormones produced by the mother maintain their significant influence on the neurodevelopment of the baby, similar to their impact observed during the initial trimester [10, 11]. Hypothyroidism can be caused by a deficiency of iodine in the diet, autoimmune thyroiditis, administration of radioactive iodine, or surgical extraction of the thyroid gland. The incidence of hyperthyroidism during pregnancy is exceedingly low, impacting less than 1 in every 1,000 pregnant women at most. The impact of subclinical hyperthyroidism on fertility and pregnancy outcomes is negligible. Hence, the primary focus lies in the screening for hypothyroidism [11, 12].

Material and Methods

A prospective study was conducted in the Department of Community Medicine, Madha Medical College and Research Institute, Chennai, India from May 2017 to April 2018. The study included 400 pregnant patients who had singleton pregnancies. Written informed consent was obtained from all subjects involved in the study. Exclusion criteria encompassed patients who had already received a diagnosis of either hypothyroidism or hyperthyroidism.

Inclusion criteria

Individuals who express a willingness to attend further appointments following their initial booking visit at GTMCH during the first trimester of pregnancy.

Patients who exhibit an elevated risk profile encompass individuals who are obese, have undergone multiple abortions, have previously utilized an intrauterine device (IUD), or have experienced prolonged attempts to conceive.

Exclusion criteria

Individuals who have received a diagnosis of a thyroid disorder Uncooperative patients who decline to come back for medical examinations Mothers who are pregnant and have molars

Methodology

During the registration process, participants were required to submit written informed consent, were presented with comprehensive inquiries regarding their medical background, underwent a comprehensive general physical examination, and had their findings documented on a standardized form.

During the initial consultation, the TSH and free T4 levels were assessed. A venous sample was collected from patients who had fasted overnight in the early morning. The thyroid function test was administered to all patients, and the obtained findings were documented and examined in order to categorize them into four groups: normal thyroid function, overt hypothyroidism, overt hyperthyroidism, or subclinical hypothyroidism/ hyperthyroidism. Subsequently, appropriate treatment measures were initiated. The subsequent phase involves evaluating the patient cohort to determine the existence of risk variables associated with thyroid dysfunction. Individuals who demonstrate risk markers are categorized as high risk, whilst those who do not are categorized as low risk. The study aimed to investigate the adequacy of screening high-risk population's vs general screening, considering the high frequency of thyroid dysfunction in both groups.

A comprehensive dataset was collected encompassing information on abortions, abruption, premature birth, low birth weight, fetal neonatal death, and birth weight. The number of problems in both the well-treated and poorly-treated groups was documented. The chi-square test was employed to assess the statistical significance of the differences between the variables, as shown by the p-value.

Results

Table 1: Thyroid profile

Thyroid status	No. of women	%
Normal	325	81%
Abnormal	75	19%
Total	400	100.0

Table 2: Types of thyroid dysfunction

Types	No. of women	%
Subclinical hypothyroidism	37	49%
Subclinical hyperthyroidism	10	50%
Overt hypothyroidism	20	27%
Overt hyperthyroidism	8	11%
Total	75	100.0

Table 3: Level of TSH

Types	No. of women	%
<0.10 ng/ml	14	3.5%
0.1 - 3.0 ng/ml	330	82.5%
3 - 5 ng/ml	24	6%
> 5 ng/ml	32	8%
Total	400	100.0

Table 4: Treatment among complication

Treatment	No. of women	%
Adequate	9	30%
Not adequate	21	70%
Total	30	100.0

Table 5: TSH and FT3

			TSH		Total
			Normal	Abnormal	
FT3	Total	Normal Abnormal	295	27	322
			55	23	78
			350	50	400

Table 6: Birth weight and Abnormal Thyroid profile

Birth weight	Abnormal thyroid profile				Chi square test
	Normal		Abnormal		
	n	%	n	%	
<2.5 kg	12	1.8%	12	20%	$\chi 2$=0.95
2.5 -3.0 kg	161	46%	18	40%	P=0.67 (NS)
3.0 -4.0 kg	177	51.6%	20	50.0%	
Total	350	100.0%	50	100.0%	

Discussion

Consequently, the technique used to detect high-risk cases of thyroid dysfunction would fail to detect approximately one-third of pregnant women with severe thyroid abnormalities. Consistent with a previous study conducted by Vaidya and colleagues, my investigation yielded identical findings. In 2012, the Endocrine Society revised their recommendations, resulting in a decrease in the maximum permissible level of TSH from 0.5 to 0.1mIu/L. The mean gestational age of this study was found to be nine weeks, which is consistent with the findings of the research conducted by Dave *et al*. The sample sizes of Nazourpur *et al*. (353 participants) and Dave *et al*. (305 participants) exhibit a notable similarity when comparing their respective research. A total of 400 pregnant women took part in this study. In their study, Vaidya *et al*. conducted an analysis on

a sample size of 1560 individuals [12, 13].

The question of whether all pregnant women should have thyroid screenings remains a subject of ongoing controversy. Nevertheless, the affordability of therapy and the extensive accessibility of screening tests are contributing to the increasing popularity of the universal screening approach, despite the absence of evidence demonstrating that identifying and treating pregnant women with subclinical hypothyroidism is more beneficial for both the mother and the baby. Although there is a dearth of evidence supporting the efficacy of treating pregnant women with subclinical hypothyroidism in terms of improving outcomes for both the mother and the child, this assertion remains valid.

The results of our study indicate that around 32.3 percent of patients diagnosed with subclinical hypothyroidism, 43.8 percent of individuals diagnosed with overt hypothyroidism, and 25 percent of individuals diagnosed with hyperthyroidism are not detected through case discovery. Roughly 43.8% of individuals with obvious hypothyroidism go unnoticed when potential risk factors for thyroid disease are included. In accordance with the findings of the study conducted by Vaidya *et al*. [13, 14].

The mean age of the participants in this study was 24, which was significantly lower compared to the mean ages of participants in the studies conducted by Ohashi *et al*. (30.8+44.7 years) and Rajesh *et al*. (28.412.2 years) (23.79 years). The findings of this study indicate a significant prevalence of undetected thyroid disorders among pregnant women. Regional variations in iodine levels may also contribute to these disparities. The prevalence of goiters was shown to be higher in regions characterized by a severe deficiency of iodine, resulting in a greater number of women in these areas meeting the requirements for the case-targeted high-risk case detection technique. According to the study conducted by Dhanwant *et al*., a prevalence rate of 14.3% was observed among women seeking medical care at a tertiary hospital in Delhi, with a significant proportion of these cases exhibiting subclinical manifestations. Based on my observations, the percentage was 12.5. The study conducted by Bandela *et al*. revealed that subclinical hypothyroidism has a prevalence rate of 2.8% among the population of Andhra Pradesh. According to Gayathri *et al*. [14, 15], the prevalence of subclinical hypothyroidism among the study participants was found to be 2.8%.

Hyperthyroidism has a less influence on individuals compared to hypothyroidism. Outward indications of hyperthyroidism are rather rare. The findings of Prince *et al*. 's study on Asian women revealed a prevalence rate of 0.02%, which closely aligns with the results of my own investigation, indicating a 1% occurrence rate. Multiple risk factors were found to be associated with thyroid problems, and this association was found to be statistically significant ($p< 0.001$). Patients with abnormal thyroid profiles exhibited a higher likelihood of experiencing unfavourable outcomes when compared to those with normal thyroid profiles ($p< 0.001$). The findings I obtained were consistent with the results reported by Negro *et al*., Vaidya *et al*., and Dave *et al*. in the state of Madhya Pradesh. There is a lack of consensus regarding the specific hazards that should have been taken into account when creating a case-finding approach. Insufficient evidence exists to establish a definitive association between age and abnormal thyroid function, despite the inclusion of age under 30 as a risk factor and the recommendation by the American Thyroid Association and European societies to conduct examinations for all women over the age of 30. Both the American Thyroid Association and European societies' guidelines identify age under 30 as a risk factor. The prevalence of pregnant women experienced a notable increase, rising from 55.3% to 85.6%, as a result of the case-finding strategy's expansion to encompass women aged 30 years and above. The determination of thyroid screening protocols should be grounded in the unique characteristics of each country and culture, as there exists significant disparity in the prevalence of these risk factors across different geographical areas [16, 17].

The present study revealed that approximately 35.6% of pregnant women in South India with thyroid dysfunction were being overlooked due to insufficient screening, primarily due to the limited presence of risk factors among pregnant women. The findings of the research suggest the following. However, a significant proportion of patients (34.4%, n=174) who had subclinical thyroid issues remained undiagnosed. Regarding the treatment of these women, there is limited available information, and some of it appears to be contradictory. Pregnancy complications have been associated with subclinical hypothyroidism, and certain studies have indicated that the use of L-thyroxine (L-T4) medication can mitigate or eradicate these risks. Nevertheless, alternative studies have indicated that the administration of L-T4 did not yield any significant reduction or elimination of these risks. The study's findings indicate that several risk factors associated with thyroid dysfunction encompass advanced age, multiple abortions, and a familial predisposition to thyroid disorders. Thyroid dysfunction can also be strongly indicated by the presence of symptoms linked with thyroid disorders. Those who had suffered several abortions during pregnancy had an increased chance of having thyroid issues compared to those who had not encountered this danger. Individuals with a familial predisposition to thyroid illnesses had a higher propensity for developing thyroid-related issues compared to those without such a familial background [18, 19].

My research was most successful because I performed it mostly with Indian pregnant women who were in their first trimester of pregnancy. This was the study's key advantage. Everyone who participated in the research was given a full evaluation of their thyroid function. This examination consisted of taking their medical history, performing a physical exam, and performing thyroid function tests. In some of the other studies, the researchers did not perform these examinations to each and every person in the study. The findings of our research, however, are not accurate enough to be applied to foretell what will occur in other regions that have varied iodine concentrations or other risk factors [19, 20].

On the other hand, there are a few studies that make the point for not screening absolutely everyone. There have only been two studies done thus far, and they both came to different findings. According to the findings of the research carried out by Negro *et al*., there was no noticeable difference in the number of negative outcomes encountered by those who got either universal or selective screening. Nevertheless, women who had thyroid problems during pregnancy who were identified and provided with treatment experienced fewer adverse consequences compared to women who had thyroid difficulties but were not detected and treated. Based on the research conducted by Lazarus *et al*., it was determined that the administration of treatment to persons with subclinical hypothyroidism did not yield any significant improvement in their condition. However, the research carried out by Pope *et al*. found that the neuropsychological performance of children whose mothers' free T_4 levels were less than 10 TSH was lower than that of children whose mothers' free T4 levels were larger than 10 TSH [20, 21].

The focused approach to identifying high-risk cases likely failed to detect around one third of pregnant women with thyroid

insufficiency. The aforementioned statement leads to the following conclusion. The implementation of universal screening for thyroid disorders during pregnancy appears to be a prudent approach, given the simplicity and cost-effectiveness of therapy, as well as the ease of obtaining a screening test. Currently, it is not feasible to suggest the treatment of subclinical hypothyroidism due to the lack of certainty regarding its impact on the newborn. However, if adequate resources were available, it would be feasible to proceed with the process. The efficacy of the targeted high-risk case discovery strategy may be rendered ineffective if ongoing prospective trials demonstrate the effectiveness of treating subclinical hypothyroidism during pregnancy. This phenomenon holds particular validity in groups when potential risk factors are not prevalent. Nevertheless, in nations such as India, where a substantial population suffers from thyroid illnesses and the government offers complimentary testing and treatment for thyroid issues, it is feasible for our governmental establishments to endorse and implement it [21, 22].

Conclusion

According to the results of this study, we can infer that universal thyroid screening is more effective than targeted case detection, as it fails to detect a substantial proportion of persons. Approximately 33% of individuals exhibit an aberrant thyroid profile. Patients with an aberrant thyroid profile exhibited a higher likelihood of experiencing problems compared to those with a normal thyroid profile. Thyroid dysfunction can be diagnosed and treated, leading to improved results for both the mother and the newborn. Furthermore, the cost of the treatment is affordable.

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Conflict of interest

Nil.

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