Pravara Med Rev; September 2020, 12(03) , 37 - 42
DOI: 10.36848/PMR/2020/13100.51298

Original article

Fetal outcome in pregnancy with thyroid dysfunction: Observational study

[1]Dr Kalyani Mahajan, [2]Dr Satish Mahajan

[1] Assistant Professor, Department of OBGY , Rural Medical College , Loni

[2] Head and Professor, Department of Medicine , Rural Medical College , Loni

Corresponding author : Dr Satish Mahajan ; Email: kalyanimahajandr@gmail.com

ABSTRACT

Background: Thyroid disorders are one of the most common problems in pregnant women that remain undiagnosed. Maternal thyroid function changes during pregnancy and inadequate adaptation to these changes results in thyroid dysfunction. Development of maternal thyroid disorders during early pregnancy can influence the pregnancy outcome and fetal development.

Material and Methods: In the study, 514 women were included, between 12 to 18 weeks of pregnancy. Serum thyroid-stimulating hormone (TSH) testing was done. In subjects with a deranged TSH value free T4 and free T3 were tested. Follow up of subjects was taken till delivery, and fetal complications arising out of thyroid dysfunction were studied.

Results: The occurrence of subclinical hypothyroidism was 9.54%, overt hypothyroidism was 2.34% and hyperthyroidism was 0.58%. When compared to subjects with euthyroidism, miscarriage, IUD/stillbirth, LBW and intrauterine growth restriction were significant fetal complications observed in subjects with hypothyroidism, with $p<0.0001$, $p=0.002$, 0.025 and 0.009. respectively. NICU admissions were 2.58 times more in subjects with thyroid disorders as compared to euthyroid subjects.

Conclusions: The present study shows high occurrence of thyroid disorders, especially subclinical and overt hypothyroidism, in pregnant women and their association with adverse fetal outcomes. Timely diagnosis and management of thyroid dysfunction is the key to avoid adverse fetal outcomes.

Keywords: Thyroid dysfunction, Fetal outcome

INTRODUCTION

Many national and international researches have proven that disorders of thyroid gland constitute one of the most frequently encountered endocrine disorders seen in pregnancy. During pregnancy, maternal thyroid function changes and insufficient adaptation to these changes results in thyroid dysfunction.[1] The production and requirement of thyroid hormone and iodine increases by 50% during pregnancy. Pregnancy is a stress test for thyroid gland, thus leading to hypothyroidism in females with finite thyroidal reserve or iodine deficiency.[2]

Maternal thyroxin is important for normal fetal brain development, neural implication, migration and structural organization, thus affecting, future intellectual development specially before the development of fetal thyroid gland.[3]

Development of maternal thyroid dysfuntion during early pregnancy can impact the fetal outcome. The leading fetal complications are prematurity, low birth weight, still birth and perinatal death. There is an increase in the incidence of NICU admissions. Maternal hypothyroidism in the 1st trimester may be deletarious for fetal brain development and leads to impairment of mental and physical growth and development and has a detrimental effect on most organ systems.[2]

There is a wide geographical variation in prevalence of hypothyroidism during pregnancy. Data from western world show that the prevalence of subclinical hypothyroidism is estimated to be 2.5%. In India, the occurence of hypothyroidism in pregnant women is much higher compared to western countries. It widely varies among various states in India, as there is deficiency of iodine in many parts. In developing countries like India, iodine deficiency is the most common cause of hypothyroidism in pregnancy. The cause of hypothyroidism may be presence of goitrogens in diet, micronutrient deficiency such as selenium and iron deficiency. Poverty, insufficient iodine supplementation and fluorinated water could be the major reason for thyroid dysfunction among pregnant females. In the sub mountain areas, the cause of increased prevalence of hypothyroidism is supposed to be the geo-chemical nature in deficiency of iodine and micronutrients, due to glaciations, high rain fall and floods leading to decrease iodine content in soil and water.[2]

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.[4]

There is a draught of studies evaluating the prevalence of thyroid dysfunction in pregnant women and its effect on the fetal outcomes. Additionally, there is a scarcity of studies in the rural population, especially in central India. Hence, our study is a sincere effort to shed some light on the topic.

MATERIAL AND METHODS

The Observational, prospective study was carried out in the Department of Obstetrics and Gynaecology, Acharya Vinoba Bhave Rural Hospital of Jawaharlal Nehru Medical College, Sawangi-Meghe, Wardha, Maharashtra, India, over a period of 2 years. The study was conducted after clearance from the institutional ethics committee.

A total of 514 randomly selected Antenatal cases attending OPD between 12 to 18 weeks of gestation, including multiple gestations, were studied and followed till delivery. Women with pre diagnosed thyroid disorder were excluded from the study.

Screening for thyroid disorder was done after a detailed history and examination with serum TSH estimation. Those with abnormal TSH values were subjected to FT4, FT3 estimation.

The reference range used in the study was based on the guidelines of the American Thyroid Association, 2011, for the diagnosis and management of thyroid disease during pregnancy and postpartum period.[3] According to the guidelines, the following reference ranges are recommended; first trimester, 0.1–2.5 μIU/mL; second trimester, 0.2–3.0 μIU/mL and third trimester, 0.3–3.0 μIU/mL. TSH was assayed by VIDAS based on the ELFA (Enzyme Linked Fluorescent Assay) technique.

Subjects were followed up and pregnancy outcomes were noted in terms of mode of delivery, miscarriage, IUD/stillbirth, IUGR, LBW, NICU admissions.

Biostatic analysis

- Statistical analysis was done using descriptive and inferential statistics. Tests used for analysis were Chi Square Test, Z Test and Odds Ratio.
- The results were analysed by using software SPSS 17.0 version and results were tested at 5% level of significance and Graph pad prism 5.0 version.

- *P* value of <0.05 was considered as significant.

Definitions

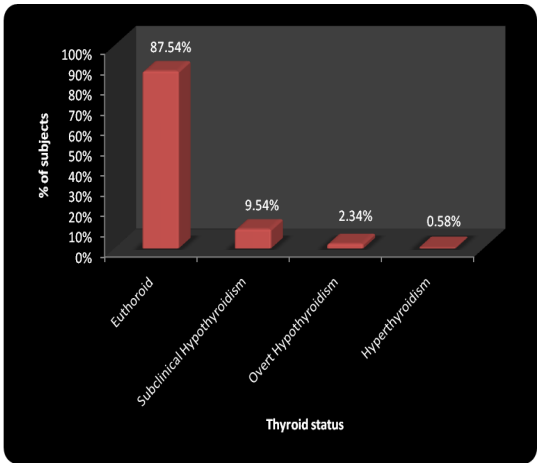
- Miscarriage was defined as spontaneous expulsion of an embryo or fetus weighing 500gm or less when it is not capable of independent survival.
- Intra Uterine Fetal Demise (IUD) was defined as intrauterine fetal demise after the period of viability.
- Stillbirth was defined as death after 28th completed week of pregnancy during labour when the baby does not show any sign of life after delivery.
- Intrauterine Growth Restriction (IUGR) was defined as birth weight of baby less than 10th percentile of average for the gestational age.
- Low birth weight (LBW) was defined as infant with birth weight of less than 2500 gm irrespective of gestational age.

RESULTS

Out of 514 subjects, 64 (12.45%) had deranged thyroid function. Prevalence of overt hypothyroidism was 2.34% and 9.54% had subclinical hypothyroidism. The prevalence of hyperthyroidism was 0.58% in the present study.

In euthyroid subjects the mean of TSH level was 1.53±0.58, in subclinical hypothyroid subjects it was 4.95±3.51, in overt hypothyroid subjects it was 6.13±2.31 and in hyperthyroid subjects it was 0.06±0.05 as depicted in Graph 2.

Graph 1: Distribution of study population according to thyroid status



Graph 2: Mean TSH Levels in different groups

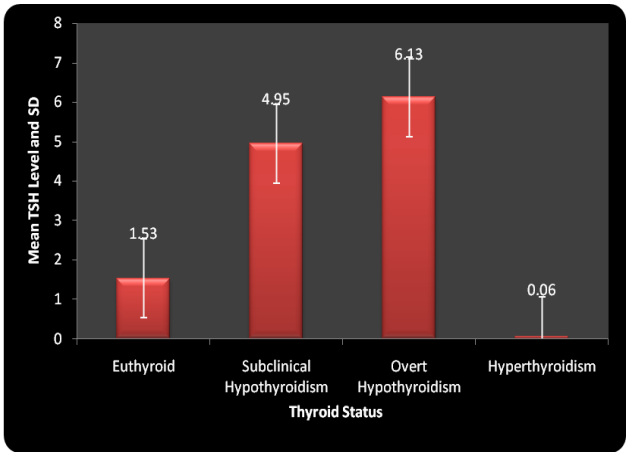


Table 1: Correlation of Thyroid status with Mode of delivery

Mode of delivery (N=376)	Subjects with thyroid disorders		Euthyroid Subjects	
	N	%	N	%
Cesarean Section	17	32.08	82	25.39
Vaginal	36	67.92	241	74.61
Total	53	100	323	100
Odd's Ratio	1.38(95% CI=0.73-2.60)			

Table 1 shows that 74.61% of euthyroid subjects, 67.44% of subjects with subclinical hypothyroidism, 66.67% of subjects with overt hypothyroidism and 100% of subjects with hyperthyroidism had vaginal deliveries where as 25.39% of euthyroid subjects, 32.56% of subjects with subclinical hypothyroidism and 33.33% of subjects with overt hypothyroidism

had Cesarean Section. Cesarean Section was 1.38 times more in subjects with thyroid disorders as compared to euthyroid subjects (Odd's ratio=1.38).

Table 2: Correlation of thyroid status with fetal outcome

Fetal outcome N=408	Euthyroid		Subclinical Hypoth yroidism		Overt Hypoth yroidism		Hyperth yroidism		Total		p-value
	N	%	n	%	n	%	n	%	n	%	
Normal	288	83.48	35	72.92	7	58.33	1	33.33	331	81.13	p<0.0001, S
Miscarriage	22	6.38	5	10.42	3	25.00	2	66.67	32	7.84	p<0.0001, S
IUD/Still Birth	4	1.16	1	2.08	1	8.33	0	0.00	6	1.47	0.002, S
LBW	13	3.77	4	8.33	1	8.33	0	0.00	18	4.41	0.025, S
IUGR	18	5.22	3	6.25	0	0.00	0	0.00	21	5.15	0.009, S
Total	345	100	48	100	12	100	3	100	408	100	
ϰ2-value	175.80, p<0.0001, Significant, p<0.05										

Table 2 shows that 6.38% of euthyroid subjects, 10.42% of subjects with subclinical hypothyroidism and 25% of subjects with overt hypothyroidism had miscarriage (p<0.0001,S). 1.16% of euthyroid subjects, 2.08% of subjects with subclinical hypothyroidism and 8.33% of subjects with overt hypothyroidism had IUD/still births (p=0.002, S).

3.77% of euthyroid subjects, each 8.33% of subjects with subclinical hypothyroidism and overt hypothyroidism had LBW (p=0.025, S) and 5.22% in euthyroid subjects and 6.25% of subjects with subclinical hypothyroidism had IUGR (p=0.009, S).

By using chi square test statistically significant difference was found between fetal outcome and thyroid status of subjects (ϰ-2 value=175.80, p<0.0001, Significant, p<0.05).

Table 3: Correlation of thyroid status with NICU admission

NICU Admission	Euthyroid		Subclinical Hypoth yroidism		Overt Hypoth yroidism		Hyperth yroidism		Total		p-value
	N	%	n	%	n	%	n	%	n	%	
No	251	78.68	25	59.52	4	50.00	1	100.00	281	75.95	p<0.0001,S
Yes	68	21.32	17	40.48	4	50.00	0	0.00	89	24.05	p<0.0001,S
Total	319	100.00	42	100.00	8	100.00	1	100.00	370	100	
ϰ2-value	74.68,p<0.0001, Significant,p<0.05										

Table 3 shows that babies of 21.32% of euthyroid subjects, 40.48% of subjects with subclinical hypothyroidism and 50% of subjects with overt hypothyroidism needed NICU admissions(p<0.0001).

Statistically significant association was found between NICU admission of babies and thyroid status of the subjects (ϰ-2 value=74.68, p<0.0001, Significant, p<0.05).

Subjects with Hyperthyroidism were not included at the time of statistical analysis as there were only 3 (0.58%) cases.

DISCUSSION

Thyroid dysfunction is a common endocrine problem in pregnant women, which has been associated with adverse fetal outcome. But it is a treateable condition. It is important to screen women who are pregnant or want to be pregnant for thyroid dysfunction, because thyroid hormone status is directly related to fetal brain development.

In present study, the occurrence of thyroid dysfunction was high with 9.54% of subclinical hypothyroid and 2.34% of overt hypothyroid subjects, thus necessitating the need for screening for thyroid dysfunction. Similar prevalence of subclinical hypothyroidism was reported by Sowmya Sri K *et al* [5] (7.2%), Ruchika Garg *et al* [6] (6.67%), Saraladevi R *et al* [2] (6.4%) and Pahwa S *et al* [1] (6%) in different parts of India. However, the prevalence of subclinical hypothyroidism was found to be higher in studies by Singh KP *et al* [7] (18%) and Inass Taha *et al* [8] (14.9%). Prevelance of hypothyroidism varies widely due to varied deficiency of iodine in different regions.

Mean TSH level in subclinical hypothyroid subjects was 4.95±3.51µIU/ml in this study. Comparably, the mean TSH values were 4.11 and 3.50 mIU/L in study by Saraladevi R *et al* [2] and Ruchika Garg *et al* [6], respectively.

The data of present study suggest that, 32.56% of subjects with subclinical hypothyroidism had Cesarean section and 67.44% had vaginal deliveries.

Hypothyroidism may exert irreversible effects on the fetus and placenta in early pregnancy, which impairs their subsequent ability to tolerate stress, thereby increasing the incidence of fetal distress in labour, and thus incidence of caesarean section.

Inass Taha *et al* [8] and Sreelatha S *et al* [4] in their studies reported the incidence of subjects with subclinical hypothyroidism undergoing caesarean section as 30.2 % and 22.9%, respectively.

In addition, hypothyroidism increased the risk of NICU admissions in present study, which is discordant with the study done by Sreelatha S *et al* [4].

Abnormal fetal outcome was 2.35 times more common in subjects with thyroid disorders as compared to euthyroid subjects (Odds ratio = 2.35).The occurrence of miscarriage ($p<0.0001$, S) and fetal death ($p<0.0002$, S) were significantly higher in the pregnant women with hypothyroidism in present study.

Because TSH is inversely related to hCG levels, women with low hCG levels are at a greater risk of fetal loss.

Also, in present study, the pregnant women with subclinical and overt hypothyroidism had a significant increase in the incidence of intrauterine growth retardation ($p=0.009$, S) and low birth weight ($p=0.025$, S).

Reduced foetal thyroxine may cause disruption to the development of the pituitary-thyroid axis of the newborn, fetal pituitary GH secretion, vascular responsiveness and maturation, cardiovascular homeostasis in utero. These factors may be responsible for observation of reduced neonatal birth weight of offsprings born to mothers with inadequately controlled thyroid function.[4]

Saraladevi R *et al* [2] in their study found that subclinical hypothyroidism in pregnancy is associated with the fetal complications like Abortions (4.68%), IUGR (6.25%), Low birth weight (4.68%) and Still birth (1.56%). Similarly, Inass Taha *et al* [8] in their study reported a higher incidence of IUD in pregnancies complicated by maternal hypothyroidism.

The impact of hyperthyroidism in pregnancy is critical on both mother and child. No significant conclusion could be drawn in the present study, as only 0.58% subjects had hyperthyroidism.

CONCLUSION

To conclude, the present study shows high occurrence of thyroid disorders, especially subclinical and overt hypothyroidism, in

pregnant women and their association with adverse fetal outcomes, thus emphasizing the need to include thyroid function test in the routine screening in the antenatal clinics. The patients should be made aware of associated potential maternal and fetal complications.

Serum TSH is a sufficient and cost-effective biochemical marker for screening of thyroid dysfunction. Timely diagnosis and management of thyroid dysfunction is the key to avoid adverse fetal outcomes.

REFERENCES:

1. Pahwa S, Mangat S. Prevalence of thyroid disorders in pregnancy. Int J Reprod Contracept Obstet Gynecol 2018 Sep;7(9):1-4.
2. Saraladevi R, Nirmala Kumari T, Shreen B, Usha Rani V. Prevalence of thyroid disorder in pregnancy and pregnancy outcome. IAIM, 2016; 3(3): 1-11.
3. Stagnaro-Green A, Abalovich M, Alexander E, et al. Guidelines of the American Thyroid Association for the diagnosis and management of thyroid disease during pregnancy hypothyroidism in pregnancy and postpartum. Thyroid. 2011;21(10):1081–125.
4. Sreelatha S et al. Int J Reprod Contracept Obstet Gynecol. 2017 Aug;6(8):3507-3513
5. Sowmya Sri K, Pramod Kumar Korani Ratnam. Prevalence of thyroid disorder in pregnancy and pregnancy outcome. MedPulse – International Medical Journal. October 2017; 4(10): 969-970.
6. Ruchika Garg, Prabhat Agrawal, Vishy Agrawal, Urvashi, Saroj Singh, Prevalence of Thyroid Dysfunction in Pregnancy, Indian Journal of Clinical Practice, Vol. 30, No. 2, July 2019:110-113.
7. Singh KP, Singh HA, Kamei H, Devi LM. Prevalence of Hypothyroidism among Pregnant Women in the Sub Mountain State of Manipur. Int J Sci Stud 2015;5(5):143-146.
8. Inass Taha, Jihan Alhazmi,Prevalence of overt and subclinical hypothyroidism among Saudi pregnant women attending tow referral hospitals in Saudi Arabia and associated maternal and fetal complications, Presented at Society for Endocrinology BES 2011, Birmingham, UK. *Endocrine Abstracts* (2011) 25 P312.

Date of Submission: 24 January 2020
Date of Publishing: 30 September 2020
Author Declaration: Source of support: Nil , Conflict of interest: Nil
Ethics Committee Approval obtained for this study? Yes
Was informed consent obtained from the subjects involved in the study? Yes
For any images presented appropriate consent has been obtained from the subjects: NA
Plagiarism Checked: Yes

DOI: 10.36848/PMR/2020/13100.51298