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Original Article

FETO-MATERNAL AND NEONATAL COMPLICATIONS ASSOCIATED WITH HYPOTHYROIDISM IN PREGNANCY

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ABSTRACT

Objective: To analyze and report the maternal, fetal, and neonatal complications in Antenatal hypothyroid women and to give the frequency of the co-existence of Anemia with Hypothyroidism in pregnancy.

Methods: A Prospective and an observational study was conducted on 200 Antenatal hypothyroid women admitted to the Obstetrics ward. In the period of 6 mo (August 2022-January 2023), the study was carried out through the examination of medical records of Antenatal women with Hypothyroidism.

Results: Of 200 Antenatal hypothyroid women enrolled in the study, Denovo Hypothyroidism was seen in 56% of women. Maternal complications reported include–(Lower Segment Cesarean Section) LSCS seen in 54.5%, Preeclampsia in 19%, mild anemia in 28%, (Post-Partum Hemorrhage) PPH in 7.5%,(Premature Rupture Of Membranes) PROM in 11.5%, Oligohydramnios in 24.5% of women. Fetal complications found were in fetal distress in 21%, in 32.5 %, Respiratory distress in 17.5%, and Low birth weight in 16% of Neonates.

Conclusion: Our study concludes that the number of pregnant women affected by Hypothyroidism has increased to a larger extent. Hence, the suspected risk factors of Hypothyroidism have to be addressed and monitored closely to decrease the rate of feto-maternal and neonatal complications in pregnancy, vital for the overall well-being of hypothyroid mothers and their babies.

Keywords: Hypothyroidism, Preeclampsia, Feto-maternal complications, Neonatal complications, Risk factors, Antenatal hypothyroid women

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INTRODUCTION

The thyroid is a Butterfly-shaped Endocrine gland present in the front region of the Neck. The two Major Hormones secreted by the Thyroid gland are Triiodothyronine [T3] and Thyroxine [T4], Thyroid Hormone secretion is under the control of Thyroid Stimulating Hormone [TSH] from the Anterior pituitary gland. TSH, in turn, is released by Thyrotropin Releasing Hormone [TRH], produced by the Hypothalamus.

Functions: Thyroid hormones acted to increase the Body's Metabolic Rate. They stimulate appetite, digestion, breakdown of nutrients, and Absorption. They also increase oxygen consumption and raise the breathing rate, heart rate, and contraction strength. As a result, the body's heat production is increased. Thyroid Hormone secretion usually rises in winter months to keep the body warm [1].

Disorders: The automated group of disorders of Thyroid includes Hypothyroidism and Hyperthyroidism, which is majorly due to the problems in the secretion of Thyroid Hormones.

Hypothyroidism: If the Thyroid gland does not produce enough hormones, it results in a lesser metabolic rate along with low respiration and cardiovascular activities [2].

Pathology of Pregnancy: Pregnancy is a stage that possesses both physiological and hormonal stress on the mother and also on her fetus. When pregnancy gets complicated by the presence of Endocrine disorders like Thyroid dysfunction, the adverse outcomes in Maternal and fetus increases. During pregnancy, there is an increase in the levels of Thyroid Hormones in the serum of the mother, because of which, either at the beginning or during the period of pregnancy Thyroid problems arise.

Hypothyroidism in Pregnancy: Thyroid dysfunction, mostly Hypothyroidism is the most common endocrine disorder observed in pregnancy next to Diabetes mellitus. There is an increased requirement for T3 and T4 hormones during pregnancy [3]. Thyroid Hormone production increases during pregnancy [4], compared to non-pregnant women. But if the Thyroid for some reason is not able to meet the increasing demand of Thyroid Hormones during pregnancy, it will lead to Thyroid dysfunction majorly Hypothyroidism. Women with Iodine deficiency and a history of Hypothyroidism are more prone to develop Hypothyroidism during Pregnancy.

Throughout pregnancy there is more demand for thyroid hormone by the pregnant mother; where BMR (Basic Metabolic Rate) is high and increased oxygen consumption. It increases by about 20-25% during pregnancy. There is also the placental transfer of thyroid hormones for the baby as well. So, there is an increased requirement for the fetus because the fetus exclusively depends on the maternal thyroid hormones during the initial 12 w of gestation. T3 and T4 can cross the placenta freely, whereas maternal TSH and TRH won't cross the placenta. So, the fetus is exclusively dependent on the maternal source of Thyroxine and Triiodothyronine in the first 12 w of gestation. Moreover, to meet the increased demand for the production of T3 and T4 hormones, the iodine requirement by pregnant women increases, with an average of 250 micrograms per day [5]. A major reason for the increase in thyroid hormone production in pregnancy is that the placenta secretes the hormone Human Chorionic Gonadotropin (HCG). This hormone has thyrotropic activity and hence, it stimulates the thyroid gland of the mother to release an increased amount of thyroid hormones.

Major risk factors which are known to be associated with hypothyroidism in pregnancy are Miscarriage, Preeclampsia, Fetal growth restriction, Low Birth Weight, Preterm Delivery, Fetal Distress, Impaired Fetal Brain Development, and deficits in intelligence in Children [6]. For the treatment of hypothyroidism in pregnancy, Hormone Replacement Therapy using Levothyroxine is mostly recommended [7]. Hence, it is essential to describe various feto-maternal and neonatal complications in pregnant women diagnosed with hypothyroidism.

MATERIALS AND METHODS

This study is of a prospective and observational type, which enrolled 200 antenatal women in the third trimester with hypothyroidism admitted in the Obstetric ward. Informed consent forms were collected from the women chosen for the study. Ethical Committee approval has been obtained from Malla Reddy Narayana Multispecialty Hospital. Patients were selected based on Age, parity, gestational week, and the reason for admission. Parameters including residence and socioeconomic status of the patients were not considered in our study.

Proposed methodology

Study design: Prospective and observational study.

Study Period: August 2022–January 2023.

Sample size: 200 Antenatal women.

Tool used: With the guidance of a healthcare professional, a pro forma is prepared.

Study Site: The Study was conducted in Obstetric wards 1 and 2 with antenatal hypothyroid women at "Malla Reddy Narayana Multispecialty Hospital", Suraram, Hyderabad, Telangana.

Inclusion criteria

- Women with preconception and pregnancy-induced hypothyroidism are included.
- Antenatal women of age>17 y to 40 y are included.
- Only hospitalized antenatal women affected with hypothyroidism are included.
- The neonatal status of newborns of antenatal women was also considered.

Exclusion criteria

- Women in the 1stand 2nd trimester of pregnancy are excluded from the study.
- Non-hospitalized antenatal are not taken into consideration.
- Record files with inappropriate maternal, fetal, and neonatal data were not considered in this project.
- Pregnancy cases of twins and triplets were not included.

Study process

The study process was conducted by collecting the medical records of the antenatal women from their bedsides. The case sheets were evaluated thoroughly to report the maternal, fetal, and neonatal complications of the hypothyroidism condition. The outcomes were assessed by presenting the maternal, fetal, and neonatal complications in the form of frequency and along with percentages. The results obtained from the study are represented in tabular and graphical format.

RESULTS AND DISCUSSION

Table 1: Thyroid status in antenatal women

Hypothyroid status	Frequency	Percentage
Denovo Hypothyroidism	112	56%
Preconception Hypothyroidism	88	44%

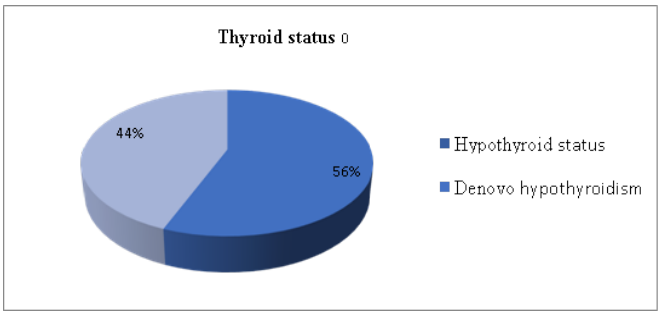

Fig. 1: Thyroid status in antenatal hypothyroid women

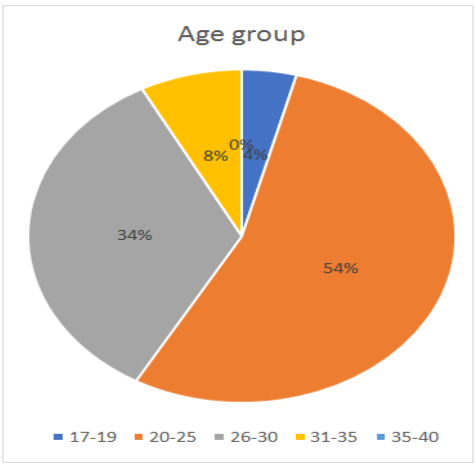

Fig. 2: The age distribution of antenatal hypothyroid women with percentages

Table 2: Age group of antenatal women

Age distribution	Frequency	Percentage
17–19	08	4 %
20–25	105	52.5 %
26–30	66	33 %
31–35	15	7.5 %
35–40	6	3%

Table 3: Parity of Antenatal hypothyroid women

Parity	Frequency	Percentage
Primigravida	73	36.5 %
Multigravida	127	63.5 %

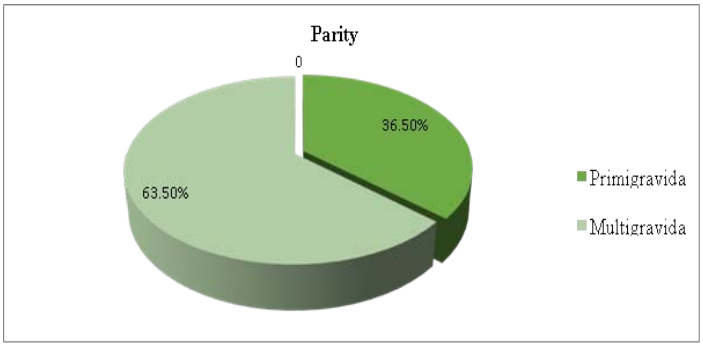

Fig. 3: Parity percentage in antenatal hypothyroid women

Table 4: Mode of delivery in antenatal hypothyroid women

Mode of delivery	Frequency	Percentage
Full Term Normal Vaginal Delivery+Right Mediolateral Episiotomy (FTNVD+RMLE)	21	10.5 %
Lower Segment Cesarean Section (LSCS)	109	54.5 %
Normal Vaginal Delivery (NVD)	70	35 %

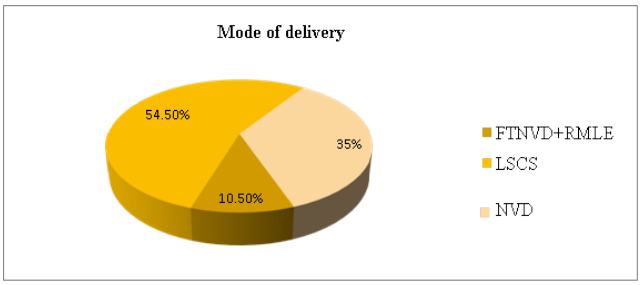

Fig. 4: The percentage of the mode of delivery in antenatal hypothyroid women

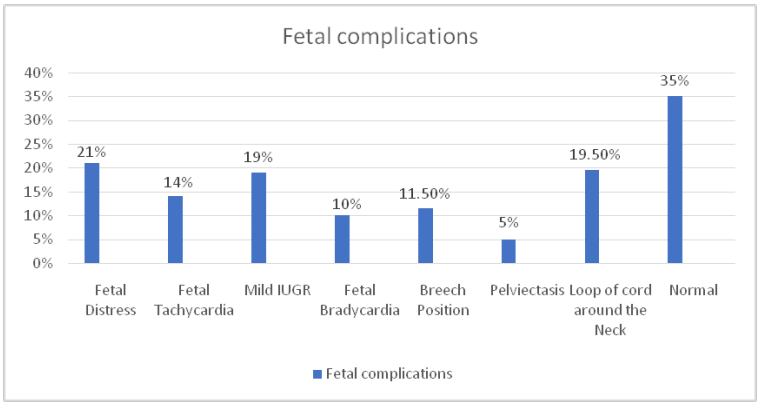

Fig. 5: Fetal complications in antenatal hypothyroid women

Table 5: Fetal complications in hypothyroid antenatal women

Fetal complications	Frequency	Percentage
Fetal Distress	42	21 %
Fetal Tachycardia	28	14 %
Mild Intra Uterine Growth Restriction (IUGR))	38	19 %
Fetal Bradycardia	20	10 %
Breech Position	23	11.5%
Pelviectasis	10	5 %
Loop of Cord around Neck	39	19.5 %
Normal	70	35 %

Table 6: Maternal complications in hypothyroid antenatal women

Maternal complications	Frequency	Percentage
Preeclampsia	38	19 %
Gestational Hypertension (GHTN)	42	21 %
Gestational Diabetes Mellitus (GDM)	32	16 %
Oligohydramnios	49	24.5 %
Polyhydramnios	20	10 %
Post Partum Hemorrhage (PPH)	25	7.5 %
Non-Progress Of Labour (NPOL)	18	9 %
Cephalo Pelvic Disproportion (CPD)	12	6%
Premature Rupture Of Membranes (PROM)	23	11.5 %
Short Intra Hepatic Cholestasis (ICP)	4	2 %
Maternal Tachycardia in Labor	14	7 %
Normal	52	26 %

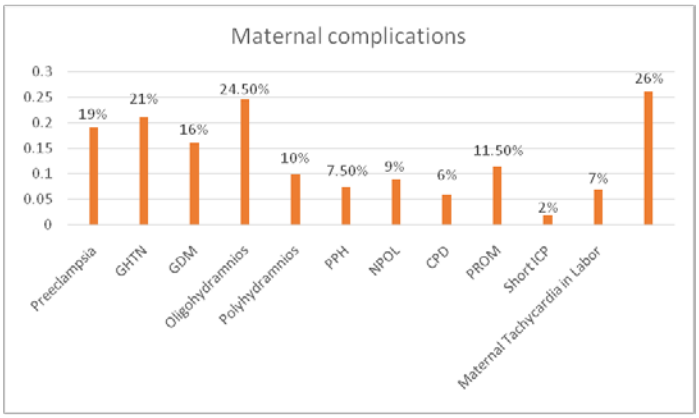

Fig. 6: Percentages of maternal complications in antenatal hypothyroid women

Table 7: Anemia status in hypothyroid antenatal women

Anemia	Frequency	Percentage
Mild (HB: 9-11 gm/dl)	56	28%
Moderate (HB: 7-9 gm/dl)	34	17%
Severe (HB:<7 mg/dl)	20	10%

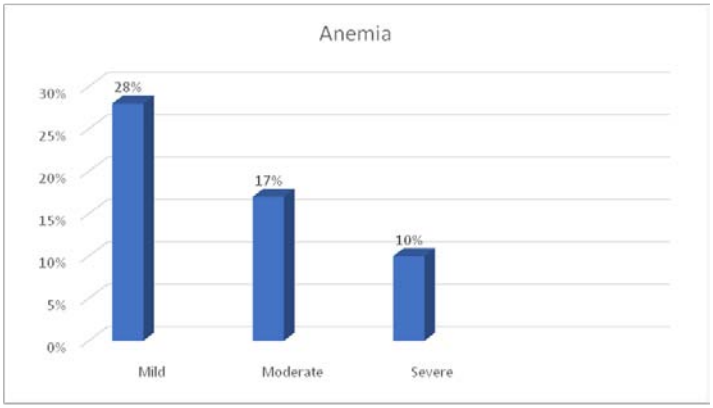

Fig. 7: Co-existence of Anemia and hypothyroidism in antenatal women

Table 8: Neonatal complications in newborns

Neonatal complications	Frequency	Percentage
Neonatal Intensive Care Unit (NICU) Admission	65	32.5 %
Respiratory Distress	35	17.5 %
Hyperbilirubinemia	40	20 %
Low Birth Weight	32	16 %
Low Appearance, Pulse, Grimace, Activity, and Respiration (APGAR) Score	21	10.5 %

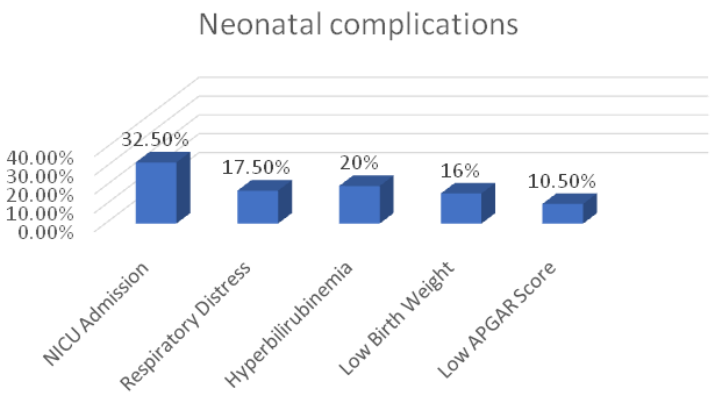

Fig. 8: Percentages of neonatal complications in antenatal hypothyroid women

Table 9: Birth status of neonates

Birth status	Frequency	Percentage
Preterm (<37weeks of gestational age)	60	30 %
Term (39-40weeks of gestational age)	95	47.5 %
Late Term (>41weeks of gestational age)	40	20 %
Dead	05	2.5 %

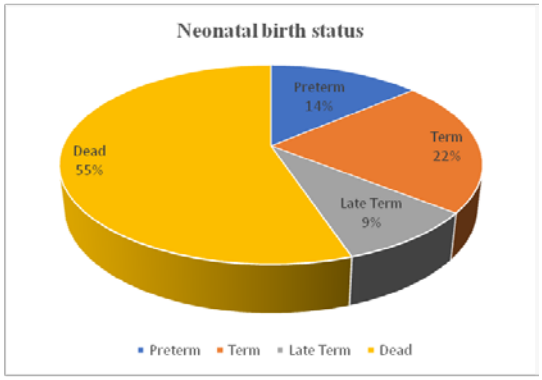

Fig. 9: Neonatal birth status in antenatal hypothyroid women

For the current study, a total of 200 cases of prenatal women suffering from hypothyroidism were collected. The study process was advanced by assessing cases based on age, parity, and the status of the thyroid gland, mode of delivery, maternal and fetal, and neonatal complications in prenatal thyroid women. The results of the study were depicted in the frequency and percent format.

Note: Of all the studies we have taken as references in our work, we have considered only these factors by the requirements of our study as in a few studies, hypothyroidism is divided into overt and Sub-clinical, but in our study, we did not classify hypothyroidism. Therefore, we considered the total number of cases of hypothyroidism in the studies by adding both the overt and subclinical cases of hypothyroidism.

Our study reported that the incidence rate of Denovo hypothyroidism is (56%) higher than preconception hypothyroidism (44%); similar results were reported in studies [8, 9] and contrasting results were observed in the work conducted by Zareen *et al.* [10]. The age classification of women with prenatal hypothyroidism found that women in the 20-25 age group (52.5%) were more numerous than other age groups of women with hypothyroidism. These findings are correlated to the studies [11, 12] and on an overall basis, when the age group of women with hypothyroidism analyzed in all studies considered 20-30 women in the age group were greater [13].

The distribution of cases under parity indicates that multigravida's account precedes primigravida, which agrees with the results of the studies [2, 3] and contradicts the results of the work [14, 15], where Primigravida counts more than Multigravida.

Mode of delivery data showed that the LSCS frequency (54.5%) was relatively above the NVD frequency (35%) and FTNVD+RMLE frequency (10.5%). Studies conducted by [16, 17] showed similar results, suggesting that LSCS is a more prevalent hypothyroid condition in pregnancy.

Fetal complications reported in our study mainly include fetal distress (21%), a loop of cord around the neck (19.5%), mild IUGR (19%), fetal tachycardia (14%), fetal bradycardia (10%), breech position (11.5%), pelviectasis (5%), loop around the neck (19.5%), and (35%) were normal. Fetal distress and NICU are fetal complications which are considered pregnancy complications and are reported in studies [18].

Maternal complications reported were Preeclampsia (19%), GHTN (21%), GDM (16%), Oligohydramnios (24.5%), Polyhydramnios (10%), PPH (7.5%), NPOL (9%), CPD (6%), PROM (11.5%), Short ICP (2%), Maternal Tachycardia (7%) and normal were 26%. Preeclampsia is the most common maternal complication of hypothyroidism [19], along with GHTN, GDM, and PPH, reported in the studies [20]. Other complications observed in most studies include oligohydramnios, NPOL, and PROM [21].

The coexistence of anemia and hypothyroidism was observed in 110 of the 200 cases studied. Mild anemias (28%) were more common in comparison with moderate (17%) and severe (10%) cases of anemia. Almost similar findings with a very slight difference between light and moderate cases were reported in the study conducted by Nidhi *et al.* In the work [22] moderate cases were reported to be more than mild and severe cases. Studies [2-5] found uncategorized maternal anemia in hypothyroid pregnant women.

Neonatal complications reported in this study include admission to NICU (32.5%) and respiratory distress (17.5%). The studies reported include hyperbilirubinemia (20%), low birth weight neonates (16%), and low APGAR scores (10.5%), and similar complications were seen in studies.

Data on the birth status of neonates born to prenatal hypothyroid women showed that full-term births (47.5%) are more. Premature (30%), late-term (20%), and dead (2.5%). In studies that have been considered in our work, where although prematurely is less than the terms, the reasonably high number of preterm babies cannot be overlooked.

CONCLUSION

The study concludes that thyroid dysfunction in particular hypothyroidism is often in pregnancy. The results revealed that the incidence of maternal hypothyroidism was significantly increased. Maternal complications should be a concern in the study including pre-eclampsia, increased frequency of cesarean sections, anemia, oligohydramnios, PROM, and PPH. The fetal complications to be warned are fetal distress, mild IUGR, and fetal tachycardia. Neonatal Complications that require attention are a higher number of NICU admissions, respiratory distress, and low birth weight. Hence, the study suggests that maternal hypothyroidism needs special attention for a safe pregnancy and the mother's and child's overall well-being.

LIMITATION OF THE STUDY

As our study is short-term and limited to one tertiary healthcare center, we recommend additional studies with a longer period and more sample size and with as many healthcare centers involved to educate the world about the defined consequences of pregnancy with hypothyroidism, which ultimately lead to a greater range of safe and healthy pregnancies.

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AUTHORS CONTRIBUTIONS

Ms. Anima Ekka and Ms. Sai Prasanna were involved in the data collection and interpretation of the results and in preparing the manuscript. Mrs. Sunanda Sabbithi reviewed the data and guided the preparation of the manuscript.

CONFLICT OF INTERESTS

Declared none

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