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PREVALENCE OF THYROID DISORDERS AND OUTCOMES ASSOCIATED WITH THYROID DISORDERS, IN ANTENATAL WOMEN ATTENDING TERTIARY CARE IN INDIA

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Abstract:

Introduction: Thyroid dysfunction is the most common endocrinological disorder in pregnancy, only second to diabetes. If not treated, they can have adverse effects on maternal and neonatal outcomes.Maternal complications include miscarriage, anaemia, preeclampsia, gestational hypertension, placental abruption, preterm delivery, increased rate of caesarean section, and postpartum haemorrhage. Fetal outcomes include preterm birth, low birth weight (LBW), perinatal morbidity and mortality, increased NICU admission; and neuropsychological and cognitive impairment.Thus it is important to adopt appropriate strategies to identify women at risk of these adverse outcomes for early detection and initiation of effective treatment, hence the study was undertaken.

Methodology: A cross - sectional study was conducted in 400 pregnant women attending antenatal outpatient department in a tertiary care after obtaining ethical committee approval. This study was conducted from march 2020 to September 2023, after obtaining written informed consent from patients. Demographic data included maternal age, parity, years of marital life, infertility, family history of thyroid disorder, menstrual history. Maternal co-morbidities pertaining to thyroid dysfunction include history of miscarriage, anaemia, preeclampsia, gestational hypertension, oligohydramnios, preterm delivery and increased rate of caesarean section. Fetal outcomes include LBW, Low Apgar score, and increased NICU admission. Routine hematological parameters and estimation of T3, T4 and TSH was conducted. The categorical variables were assessed using Pearson chi-square test and continuous variable using t test. The test was considered significant when the p value is less than 0.05.

Results: The prevalence of thyroid disorders in this study was 16% (64/400 patients), with subclinical hypothyroidism (10.75%) being the commonest, followed by overt hypothyroidism (3.25%) and subclinical hyperthyroidism (2%).Thyroid disorders seen in more proportion of patients with gravida 1(68.75%) compared to gravida 2 (31.25%) which was significant. More proportion of patients with thyroid disorders have anaemia, pre-eclampsia, gestational diabetes mellitus and significant family history when compared with euthyroid patients and this was significant statistically. Preterm labour, assisted labour and cesarean section was seen in more patients with thyroid disorders compared to euthyroid

patients. Fetal complications like low birth weight, low APGAR score and need for NICU admission was seen in more babies with mothers having thyroid disorders which was significant statistically.

Conclusion: Our study shows high complication rates associated with thyroid disorders in pregnancy, thus insisting on screening for thyroid disorders for better foetal and maternal outcomes

Keywords: Thyroid disorders, prevalence, pregnant, Fetal outcome, Maternal outcome, India.

INTRODUCTION

Thyroid disorders (which including hyperthyroidism and hypothyroidism) are common in women of childbearing age. Thyroid dysfunction is the most common endocrinological disorder in pregnancy, only second to diabetes, when left untreated, they can have adverse effects on maternal and neonatal outcomes. [1]

Stress of pregnancy may result in clinical or sub clinical hypothyroidism in women with limited reserve. Reference ranges of TSH or free thyroxine (fT4) in pregnant women changes when compared to nonpregnant women as there is physiological changes in thyroid function in pregnancy. Physiological and hormonal changes in pregnancy result in increased production of thyroxin (T4) and triiodothyronine (T3) by up to 50%, leading to an increase in a woman's daily iodide requirement.[2]

Assessment of thyroid function is pertinent during pregnancy because of its proven influence on feto-maternal outcomes. As soon as pregnancy is established, thyroid physiology starts altering, which continues throughout the gestation, but is reversible postpartum.[3] The factors responsible include increased thyroxine-binding globulin (TBG), increased renal loss of iodine, altered peripheral metabolism of peripheral thyroid hormones, and change in iodine transfer to the placenta.[4] These changes help prepare the maternal thyroid gland to mitigate the increased physiological demands.Alsoprimary hypothyroidism was associated with increased pregnancy complications, including preeclampsia, gestational diabetes, preterm birth, induction of labour, and caesarean section. [5]

Maternal complications include miscarriage, anaemia, preeclampsia, gestational hypertension, placental abruption, preterm delivery, increased rate of caesarean section, and postpartum haemorrhage. The mode of delivery may have adverse impacts on fetal-pituitary-thyroid axis. Fetal outcomes resulting from thyroid dysfunction are preterm birth, neonatal respiratory distress syndrome, low birth weight (LBW), perinatal morbidity and mortality, increased NICU admission; and neuropsychological and cognitive impairment. Thyroid hormone is critical for brain development in the developing foetus. [7]

There is a wide geographical variation in the prevalence of thyroid disorders and their feto-maternal complications in pregnant women.[7] In India, as per existing literature, the prevalence of overt and subclinical hypothyroidism in pregnancy is reported between 3 to

4.58% and 6.47–9%, respectively.[8] Overt and subclinical hyperthyroidism complicates around 0.4–1.7% and 0.4–0.7% of pregnancies, respectively.[9]

In view of potential adverse outcomes associated with maternal thyroid disorders and obvious benefits of treatment, it is important to adopt appropriate strategies to identify women at risk of these adverse outcomes for early detection and initiation of effective treatment.Hence this study aims to determine the prevalence of thyroid disorders in pregnancy and its maternal and foetal outcomes in a tertiary care facility in India.

METHODOLOGY

A cross - sectional study was conducted in pregnant women attending antenatal outpatient department in a tertiary care. This study was conducted from march 2020 to September 2022, after obtaining written informed consent from patients. A total of 400 patients attending our OPD at first antenatal visit were included in our study and venous blood sample for thyroid profile (including TSH, T4 and T3) was drawn from subjects and biochemical analysis was done within one hour of collection.

Inclusion criteria: All pregnant women coming to Outdoor Patient Department at their first antenatal visit and all patients diagnosed with spontaneous abortions i.e. missed, complete, incomplete and threatened abortions were included

Exclusion criteria: Women with multiple pregnancies, a known case of thyroid disorder, on any treatment or with any pre-existing medical disorder, such as diabetes mellitus, or cardiac or pulmonary disease were excluded.

Demographic data included maternal age, parity, years of marital life, infertility, family history of thyroid disorder, menstrual history. Maternal co-morbidities pertaining to thyroid dysfunction include history of miscarriage, anemia (haemoglobin level less than 10 g/dl), preeclampsia (blood pressure more than 140/90 with proteinuria after 20 weeks gestation), gestational hypertension (blood pressure more than 140/90 without proteinuria after 20 weeks gestation), oligohydramnios (amniotic fluid Index ≤5), preterm delivery (delivery before completion of 37 weeks of gestation) and increased rate of caesarean section. Fetal outcomes include LBW (neonatal birth weight less than 2.5 kg), Low Apgar score (1-min Apgar less than 5), and increased NICU admission.

Routine haematological parameters and estimation of T3, T4 and TSH was conducted. Cut off values used for TSH were those indicated by the American Pregnancy and Thyroid Association: 1st trimester: 0.1–4.0mIU/L, 2nd trimester: 0.2–4.5mIU/L, 3rd trimester: 0.3 - 5mIU/L [7]. Normal free T4 level is 0.7 to1.8 ng/dl and free T3 level is 1.7 to 4.2 pg/ml. Patients with normal fT4 and high TSH were considered to have subclinical hypothyroidism (SCH); those with low fT4 and high TSH were considered to have overt hypothyroidism; those with normalfT4 and low TSH were considered to have subclinical hyperthyroidism; and those with highT4 and low TSH were considered to have overt hyperthyroidism. [10] The trimester wise cut-off levels of TSH for diagnosis of hypothyroidism were taken. [11]

Statistical analysis:

Statistical analysis was conducted using Statistical Package for the Social Sciences (SPSS Version 25). The categorical variables were assessed using Pearson chi-square test and continuous variable using t test. The test was considered significant only when the *p* value is less than 0.05.

RESULTS

Out of the 400 patients in the study, age ranges from 17- 36 years with mean ± Standard deviation (SD) of age being 25.14 ± 5.82, with majority belonging to 20-30(75.25%) years age group. Comorbidities included, preeclampsia/ eclampsia, gestational diabetes mellitus, psychiatric disease and others in 18.25%, 12%, 4%, and 2% (urticaria in 1, UTI in 2, tinea in 1, dermatitis in 4patients). Marital life was <5 years in 67% of patients. Primigravida in 53% and gravida 2 in 47% of patients. Family history of thyroid disorder, history of infertility treatment and irregular menstrual disorder was seen in 24.5%, 6.75% and 30.5% patients respectively. (shown in table 1)

TABLE 1: PATIENTS BY AGE, SEX AND DURATION OF TYPE2 DM

Socio-demographic detail	Category	Frequency (n=400)	Percentage
Age of mother in years	< 20 years	8	2%
	20 – 30 years	251	75.25%
	>30 years	141	22.75%
Comorbidity	Preeclampsia and eclampsia	75	18.25%
	Gestational diabetes mellitus	48	12%
	Psychiatric disease	16	4%
	Others	8	2%
Duration of marriage	< 5 year	268	67%
	≥ 5 year	132	33%
Gravida	1	212	53%
	2	188	47%
Family history of thyroid disorder		98	24.5%

History of infertility treatment	27	6.75%
Irregular menstrual disorder	122	30.5%

The range forSerum albuminwas1.3–3.6withmean2.8 ±1.4,creatinine ranges from0.60 - 1.20 with mean 1.04 ± 0.14. Mean and SD of TSH, free T3 and T4 was 3.47±2.9 (range 0.25-6.5), 2.12±1.2 pg/dl (range1.12-4.9) and 2.79±0.61 µg/dl(range 1.7-5.4). Haemoglobin ranges from 5.6gm/dl - 13.8 gm/dl, with mean 10.1±3.31.Range for FBS was 76- 115mg/dl with mean of 81.18 ± 4.75, range for PPBS was 97-188 with mean 144.6 ± 6.75. (Showninthetable 2)

TABLE 2: MINIMUM, MAXIMUM MEAN AND STANDARD DEVIATION OF VARIABLES STUDIED.

Parameters (n=300)	Minimum	Maximum	Mean	SD
Serum albumin mg/dl	1.3	3.6	2.8	1.4
Serum Creatinine	0.60	1.2	1.04	0.14
Hemoglobin g/dl	5.6	13.8	10.1	3.31
TSH	0.25	6.5	3.47	2.9
Free T3 pg/dl	1.12	4.9	2.12	1.2
Free T4 µg/dl	1.7	5.4	2.79	0.61
FBS mg/dl	76	115	81.18	4.75
PPBS mg/dl	97	188	144.6	6.75

The prevalence of thyroid disorders in this study was 16% (64/400 patients), with subclinical hypothyroidism (10.75%) being the commonest, followed by overt hypothyroidism (3.25%) and subclinical hyperthyroidism (2%). (shown in table 3)

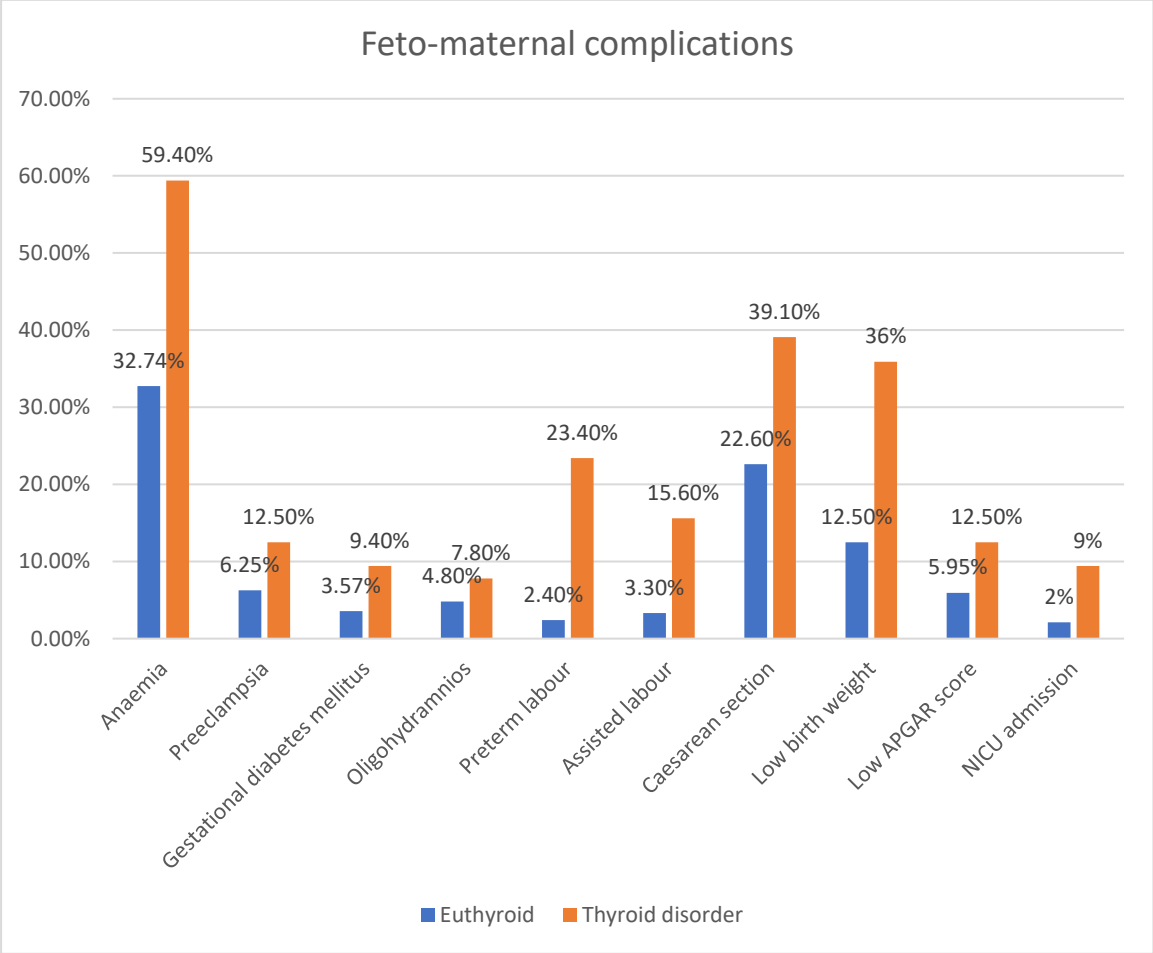
Table 3: Thyroid disorders in study participants

Thyroid status	Prevalence (n/%)	Mean TSH (mIU/L)	Mean f T4 (ng/dl)	Mean fT3 (pg/ml)
Subclinical hypothyroidism	43 (10.75%)	9.1±1.31	1.11±0.31	3.79±0.56
Overt hypothyroidism	13 (3.25%)	13.6±3.38	0.4±0.81	0.91±0.56
Subclinical hyperthyroidism	8 (2%)	10.1±3.31	10.1±3.31	10.1±3.31

Anaemia, preeclampsia, gestational diabetes mellitus, oligohydramnios, preterm labour,

assisted labour, caesarean section were more common maternal complications in pregnant with thyroid disorders than in euthyroid pregnant. Fetal complications assessed were low birth weight, low APGAR and need for NICU admission, which was more common in pregnant with thyroid disorders. (shown in figure 1)

Figure 1: Prevalence of maternal and fetal risk factors in study population



Mean age of patients was high in patients with thyroid disorders (29.1) compared to euthyroid patients (27.7),which was not significant statistically. Thyroid disorders seen in more proportion of patients with gravida 1(68.75%) compared to gravida 2 (31.25%) which was significant. More proportion of patients with thyroid disorders have anaemia, pre-eclampsia, gestational diabetes mellitus and significant family history when compared with euthyroid patients and this was significant statistically. Preterm labour, assisted labour and cesarean section was seen in more patients with thyroid disorders compared to euthyroid patients. Fetal complications like low birth weight, low APGAR score and need for NICU admission was seen in more babies with mothers having thyroid disorders which was significant statistically. (shown in table 4)

Table 4: Distribution of variables in euthyroid versus thyroid disorderpregnant

Characteristics		Euthyroid (336)	Thyroid dysfunction (64)	Chi-square or t test/ P value
Age in years (mean ± SD)		27.7±5.9	29.1±8.8	1.59/0.11
Gravida	1	168 (50%)	44(68.75%)	7.5/0.005

	2	168 (50%)	20 (31.25%)	
Postive Family history		46 (13.7%)	52 (81.25%)	132.65/0.0001
Anaemia		110(32.74%)	38(59.4%)	16.36/0.000052
Preeclampsia		21(6.25%)	8(12.50%)	3.123/0.07
Gestational diabetes mellitus		12(3.57%)	6(9.4%)	4.2/0.04
Oligohydramnios		16(4.8%)	5(7.8%)	1.005/0.316
Preterm labour		8(2.4%)	15(23.4%)	43.98/Z<0.00001
Assisted labour		11(3.3%)	10(15.6%)	16.48/0.000049
Caesarean section		76(22.6%)	25(39.1%)	7.7/0.005518
Low birth weight		42(12.5%)	23(35.9%)	21.69/<0.00001
Low APGAR score		20 (5.95%)	10 (12.50%)	7.25/0.000709
NICU admission		7 (2.1%)	16 (9.4%)	52.09</0.00001

DISCUSSION

Thyroid disease is the second most common endocrine disorder encountered in pregnant women with substantial maternal and foetal implications. The levels of thyroid hormone in pregnancy show characteristic changes from the nonpregnant state and vary with each trimester.[12]Thyroid hormone are crucial during pregnancy to support the growth and development of the foetal brain and nervous system.[13] The foetus depends on the maternal thyroid hormones throughout the 1st 10 to 12 weeks of pregnancy until the foetal-thyroid gland starts to function.[14] The maternal thyroid gland has to adapt to fulfil the increased demand for thyroid hormone production during pregnancy.[15,16]. Thus, estimating the prevalence of thyroid disorders and understanding the associated risk factors with thyroid disorders in pregnant women is needed. Hence the study was done.

In our study, the prevalence of thyroid disorders was 16% (64/400 patients), with subclinical hypothyroidism (10.75%) being the commonest, followed by overt hypothyroidism (3.25%) and subclinical hyperthyroidism (2%).

In study by Roushali k et al, Out of 347, the overall prevalence of thyroid dysfunction was 34% (n = 102), of which 32% (n = 95) and 2.3% (n = 7) had hypo and hyperthyroidism, respectively. Of the total hypothyroid women, 6.3% (n = 19) had overt hypothyroidism, while 25.3%(n = 76) had sub-clinical hypothyroidism.[17]

In study by Gupta H P et al, Prevalence of thyroid disorders was 8.6%. Subclinical hypothyroidism was the most common thyroid disorder (n=79; 7.5%) followed by overt hypothyroidism (n=10; 1%) and hyperthyroidism (n=1; 0.1%) respectively.[18]

In our study the mean serum TSH among pregnant with subclinical hypothyroidism, overt hypothyroidism and subclinical hyperthyroidism were 9.1±1.31, 13.6±3.38 and 10.1±3.31, respectively. Mean serum T3 among pregnant with subclinical hypothyroidism, overt hypothyroidism and subclinical hyperthyroidism were 3.79±0.56, 0.91±0.56 and 10.1±3.31 respectively. Mean serum fT4 levels among women with subclinical hypothyroidism, overt

hypothyroidism and subclinical hyperthyroidism were 1.11±0.31, 0.4±0.81 and 10.1±3.31 respectively.

In study by Mahadik K et al, Mean serum TSH levels among women with subclinical hypothyroidism, overt hypothyroidism and subclinical hyperthyroidism were 8.02 ± 1.25mIU/ml, 11.92 ± 5.34mIU/ml and 0.07 ± 0.03mIU/ml, respectively. Mean serum fT3 levels among women with subclinical hypothyroidism, overt hypothyroidism and subclinical hyperthyroidism were 2.92 ± 0.454 pg/ml, 1.58 ± 1.43 pg/ml, and 4.16 ± 0.40 pg/ml, respectively. Mean serum fT4 levels among women with subclinical hypothyroidism, overt hypothyroidism and subclinical hyperthyroidism were 1.09 ± 0.30 ng/dl, 0.36 ± 0.24 ng/dl and 1.2 ± 0.10 ng/dl, respectively.[6]

In this study Mean age of patients was high in patients with thyroid disorders (29.1) compared to euthyroid patients (27.7), which was not significant statistically. Thyroid disorders seen in more proportion of patients with gravida 1(68.75%) compared to gravida 2 (31.25%) which was significant. More proportion of patients with thyroid disorders have anaemia, pre-eclampsia, gestational diabetes mellitus and significant family history when compared with euthyroid patients and this was significant statistically.

In study by Mahadika K et al, of the 22 women with dysfunction, 22.7% had a history of irregular menstrual rhythm; 4.5% had history of infertility treatment; 4.5% had family history of thyroid disorder and 4.5% had history of recurrent miscarriage. There was no statistically significant association between any of these factors and the occurrence of thyroid disorder (*p* values were 0.655, 0.217, 0.079, and 0.752, respectively. [6]

In study by Kotani T et al, there were no significant differences in other baseline characteristics like maternal age, nulliparity, and maternal chronic diseases among the control, hyperthyroidism, and hypothyroidism groups. [1]

A study by Roushali Kumar et al observed that the most affected women were between 26 and 30 years of age, followed equally by the 21–25 and > 30 years age group. But this association with age was not statistically significant on chi-square test (p-value>0.05). However, statistically, significant differences were observed for the patients' socioeconomic status and educational qualification. There was a significantly higher prevalence of hypothyroidism in the primigravida (53.7%; n = 51), while hyperthyroidism was seen exclusively in the multi-para women (100%; n = 7). Another important finding in their study was a significantly higher incidence of emergency lower segment cesarean section (LSCS) in hypothyroid women (48.4%; n = 46) as compared to euthyroid women (32.3%; n = 64). On the other hand, most hyperthyroid women (71.4%; n = 5) ended in abortion and underwent suction and evacuation. Women with hypo (36.8%; n = 35) and hyperthyroidism (28.5%; n = 2) depicted a higher incidence of preterm labor compared to euthyroid women (33.8%; n = 67).

In this study anaemia, preeclampsia, gestational diabetes mellitus, oligohydramnios, preterm labour, assisted labour, caesarean section were more common maternal complications in pregnant with thyroid disorders than in euthyroid pregnant. Fetal complications assessed were

low birth weight, low APGAR and need for NICU admission, which was more common in pregnant with thyroid disorders. we observed that a higher number of hypothyroid women underwent LSCS (emergency or elective), 39.1%. Other authors have reported rates of cesarean delivery of 22.9% in women with hypothyroidism.[1,19] The rates are higher than the routine cesarean delivery rate in India, which is estimated to be around 17%.[20]

In study by Roushali Kumar et al Hypothyroid women had a higher incidence of preeclampsia (14.7%; n = 14 vs. 5.6%; n = 11), anemia (7.4%; n = 7 vs. 6.1%; n = 12), abortion (7.4%; n = 7 vs. 0.5%; n = 1), meconium-stained liquor (5.3%; n = 5 vs. 2.5%; n = 5). On the other hand, abortions (71.4%; n = 5 vs. 0.5%; n = 1) and intrauterine death (14.3%; n = 1 vs. 5.6%; n = 11) were the most common complications in women with hyperthyroid disorders.[17]

In study by Gupta H P et al, prevalence of pregnancy complications like preterm labour, PIH, abruption, IUD, IUGR and abortion was significantly higher in women with thyroid disorder as compared to euthyroid women. [18]

In this study Preterm labour, assisted labour and cesarean section was seen in more patients with thyroid disorders compared to euthyroid patients. Fetal complications like low birth weight, low APGAR score and need for NICU admission was seen in more babies with mothers having thyroid disorders which was significant statistically

In study by Roushali Kumar et al, proportion of low birth weight and very low birth weight neonates in women in hypothyroid group were (33%, n = 29), and (12.5%; n = 11) respectively, which was higher than the euthyroid group (27.9%; n = 55, 6.1%; n = 12). Whereas in the hyperthyroid group 5,0% (n = 1) were meagre birth weight. Similarly, infants with low APGAR scores of <7 at 5 min were significantly more in hypo (11.4%; n = 10) and hyperthyroid mothers (50%; n = 1) as compared to euthyroid women (7.6%; n = 15) (p-value<0.05).[17]

In study by Mahadik et al Risk of delivery of LBW babies is 6.3 times higher in women with hypothyroidism (95% CI=2.03–19.5) than in women with euthyroidism. Risk of NICU admission and low Apgar score were 0.14 times (95% CI=0.0480.39) and 3.6 times (95% CI=1.04–12.7) higher in babies born to women with hypothyroidism compared to those born to women with euthyroidism. [6]

CONCLUSION

Our study shows high complication rates associated with thyroid disorders in pregnancy, thus insisting on screening for thyroid disorders for better foetal and maternal outcomes. Anaemia, preeclampsia, gestational diabetes mellitus, oligohydramnios, preterm labour, assisted labour, caesarean section were more common maternal complications in pregnant with thyroid disorders. Fetal complications encountered were low birth weight, low APGAR score and need for NICU admission.

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