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Original Research Article

Universal screening for hypothyroidism in all antenatal women at tertiary center

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Abstract

Background: Maternal hypothyroidism in the most common thyroid disorder in pregnancy, has been associated with abortions, pre-eclampsia, preterm labor, placental abruption, and postpartum hemorrhage. Fetal complications include low birth weight babies, preterm delivery, intrauterine growth restriction, high rates of stillbirth and neonatal deaths, neonatal hyperbilirubinemia, higher incidence of neonatal hypothyroidism, and increased perinatal mortality.
Methodology: Prospective observational study was conducted to screen all antenatal women meeting inclusion and exclusion criteria. Higher values were further tested, treated and cases were followed up till delivery. Both maternal and neonatal outcomes documented.
Results: 703 antenatal women screened 62 were hypothyroid, prevalence was 8.8%.it was more in 34 to 40 years, multigravida, second trimester. The maternal outcome among hypothyroid women were abortion 6.5%, Preeclampsia 27.4%, GDM 4.8%, Oligohydramnios 4.8%, Abruptio placentae 8.1%, PPH 3.2%, Preterm labor 11.3%. The fetal outcome was LBW 11.3%, Low APGAR score 27.4%, IUGR 12.9%, Still birth 1.6%, IUFD 8.1%, NICU admission 25.8%, Hyperbilirubinemia 4.8%.
Conclusion: Thyroid screening is a must at first booking, preferably prenatally to prevent miscarriages. As fetus needs thyroxine for brain development, growth, and lung maturation, adequate replacement therapy should be done to keep TSH within trimester specific reference ranges. Significant adverse effects on maternal and fetal including lower neurocognitive effects were seen emphasizing the importance of routine antenatal thyroid screening.

Keywords: Universal screening, hypothyroidism, antenatal women

Introduction

Thyroid disorder constitutes one of the most common endocrine disorders in pregnancy. Women with thyroid dysfunction both overt and subclinical are at increased risk of pregnancy

related complications and fetal complications [1, 2, 3]. Pregnancy is associated with profound modifications in the regulation of thyroid function. These changes are the result of various factors like increase of thyroxine binding globulin (TBG) due to elevated estrogens and Human chorionic gonadotropin (HCG), increased renal losses of iodine due to increased glomerular filtration rate, modifications in the peripheral metabolism of maternal thyroid hormones and modification in iodine transfer to placenta [1].

Maternal hypothyroidism in the most common thyroid disorder in pregnancy, has been associated with infertility, 1st trimester spontaneous abortions, threatened abortions, pre-eclampsia, preterm labor, placental abruption, and postpartum hemorrhage. Fetal complications include low birth weight babies, preterm delivery, intrauterine growth retardation, high rates of stillbirth and neonatal deaths, neonatal hyperbilirubinemia, higher incidence of neonatal hypothyroidism, and increased perinatal mortality [1, 2]. Maternal hypothyroidism during early pregnancy retards the neurological development in fetal stage and also impairs the cognitive development thereby leading to learning disability and lowered achievement motivation in later stages of childhood [4]. The prevalence of hypothyroidism as per various studies varies. Significant adverse effects on maternal and fetal outcome were seen emphasizing the importance of routine antenatal thyroid screening [1, 2, 4, 5, 6, 7].

In spite of diagnosis of hypothyroidism in first trimester and adequate treatment there was significant increase in maternal and perinatal complications. Early diagnosis in first trimester can prevent the fetal brain damage and neuro intellectual development of the fetus. In Indian scenario, universal screening for thyroid disorder is essential as there is significant increase of thyroid dysfunction in iodine deficient areas [8, 9, 10, 11]. Hence present study is undertaken to know the need of universal screening for hypothyroidism in antenatal women in assessing the prevalence and early detection of hypothyroidism.

Methodology

This prospective study was undertaken in Department of OBG, Vijayanagar Institute of Medical Sciences, Ballari from 1st October 2016 to 31st March 2018. All antenatal women reporting to the ANC clinic before 26 weeks of pregnancy excluding known cases of diabetes Mellitus, Hypertension, Autoimmune disorders, Twin gestation, patients with known thyroid disorder and on medication were included in the study. After informed consent, all cases meeting the inclusion criteria and were evaluated by history taking, clinical examination. Their venous sample was tested for TSH levels. TSH was assayed by Chemi luminescent immunoassay kit (CLIA kit). In patients with deranged TSH, FT_3 and FT_4 levels was be checked. The reference range based on the Guidelines of the American Thyroid Association for the Diagnosis and Management of Thyroid Disease during Pregnancy [12] was used in the study. Results of TSH was grouped as normal, low and high. If high TSH is detected, those pregnant women were subjected to further free T_3, T_4 levels testing and were treated with L Thyroxin and followed up till delivery. Thyroid function tests were repeated every six weeks during pregnancy and drug dosage were titrated accordingly.

Maternal outcome was noted in terms of Pre-eclampsia, Abruptio placentae, Preterm labor and Abortions. Fetal outcome terms of Preterm delivery, Low birth weight, Intrauterine growth retardation, Still births and Neonatal deaths, Neonatal Hyperbilirubinemia, and Neonatal Hypothyroidism were documented.

Statistical analysis

The data collected was entered into an excel sheet and after appropriate data filtration, the data sheet was transferred and analyzed using SPSS software version 24.0. Appropriate descriptive statistics like Proportion (%), Rates, Mean, Standard Deviation were used to

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describe the data variables. Appropriate inferential statistics like Chi square test was applied, to find the association between the prevalence of hypothyroidism and other data variables (Age, Parity, Gestational age, Abortion). A P value of < 0.005 at 95th% confidence limits was considered to be statistically significant.

Result

Out of 703 antenatal women screened, 641 (91.2%) were Euthyroid, 62 (8.8%) were Hypothyroid, same is depicted in Table no.01. Graph 01, Table no. 02 shows prevalence of hypothyroidism is more in 36-40 yrs. age group (25.0%), followed by 31-35yrs (22.1%). Graph 02 shows prevalence of hypothyroidism more in Multigravida, Gravida 4 (14.6%), Gravida 3 (11.1%), Gravida 5 (9.5%), Gravida 1 (9.2%), Gravida 2 (5.4%). 55 had history of Abortion, in that 18 were Hypothyroid (32.7%). Prevalence of Hypothyroidism more in patients with history of Abortion. P value < 0.001, strongly significant (Table no. 03). Increased prevalence of hypothyroidism noted in 2nd trimester 8.9%, in 1st trimester 8.6%, same is depicted in table 04.Prevalence of hypothyroidism more in Overweight, BMI of 25-30(46.7%), BMI 18-25 normal (38.7%), BMI 31-35 class 1 obesity (11.2%), BMI 35-40 class 2 obesity (3.2%) (Table 05). Among 62 hypothyroid women, CS 25(40.3%), preeclampsia17 (27.4%), Preterm labour7 (11.3%), Abruptio placenta5 (8.1%), Abortion 4(6.5%), GDM3 (4.8%), Oligohydramnios 3 (4.8%), PPH 2(3.2%), same is depicted in Graph no.03. In our study, the fetal outcome of total 62 hypothyroid women were, Low APGAR 1 minute < 7 - 27.4%, NICU admission 25.8%, IUGR 12.9%, LBW 11.3%, IUFD 8.1%, Hyperbilirubinemia 4.8%, Still birth 1.6%, same is depicted in Graph no.04.

Table 1: Distribution of the study subjects based on their Thyroid status

Thyroid status	Frequency	Percent
Euthyroid	641	91.2
Hypothyroid	62	8.8
Total	703	100

Table 2: Age wise prevalence of Hypothyroidism among the study subjects

Age group	Total	Hypothyroid	Prevalence	95% CI	P value
18 - 20 yrs.	178	10	5.6%	3.08% - 10.03%	0.005
21 - 25 yrs.	320	28	8.8%	6.12% - 12.36%	
26 -30 yrs.	152	12	7.9%	4.57% - 13.29%	
31 - 35 yrs.	45	10	22.2%	12.55% - 36.27%	
36 - 40 yrs.	8	2	25.0%	7.15% - 59.07%	
Total	703	62	8.8%	6.94% - 11.15%	

Table 3: Abortion wise prevalence of Hypothyroidism among the study subjects

Abortion	Total	Hypothyroid	Prevalence	95% CI	P value
Yes	55	18	32.7%	21.81%-45.9%	< 0.001
No	648	44	6.8%	5.09% - 8.99%	
Total	703	62	8.8%	6.94% - 11.15%	

Table 4: Gestation wise prevalence of Hypothyroidism among the study subjects

Gestation	Total	Hypothyroid	Prevalence	95% CI	P value
1st trimester	233	20	8.6%	5.63% - 12.89%	0.877
2nd trimester	470	42	8.9%	6.67% - 11.86%	
Total	703	62	8.8%	6.94% - 11.15%	

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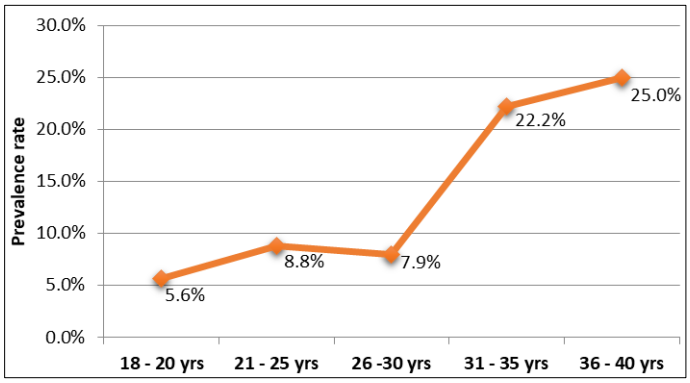
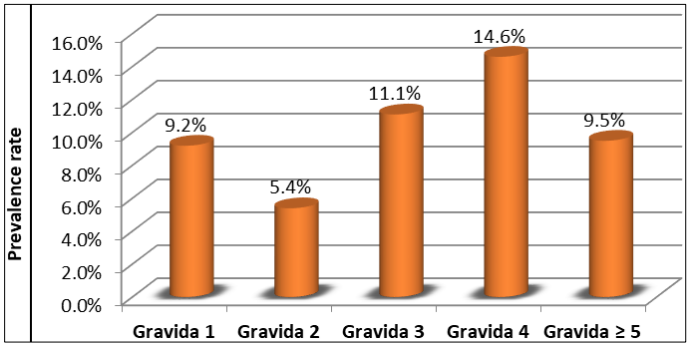
Table 5: Distribution of hypothyroid study subjects based on Body Mass Index

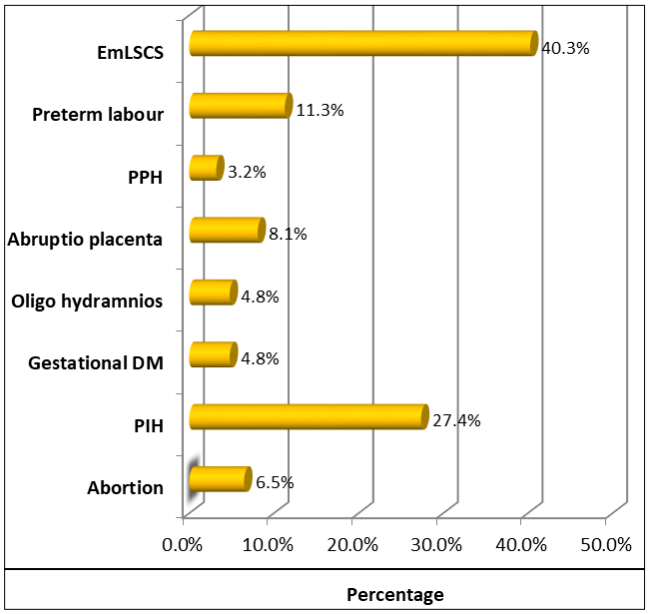
BMI	Frequency	Percent
<18 (Underweight)	0	0.0%
18-25 (Normal)	24	38.7%
25-30 (Overweight)	29	46.7%
31-35 (Class I obesity)	7	11.2%
35-40 (Class II obesity)	2	3.2%
Total	62	100%



Graph 1: Age wise prevalence of hypothyroidism among the study subjects



Graph 2: Gravida wise prevalence of hypothyroidism among the study subjects



Graph 3: Maternal outcome among hypothyroid study subject (n= 62)

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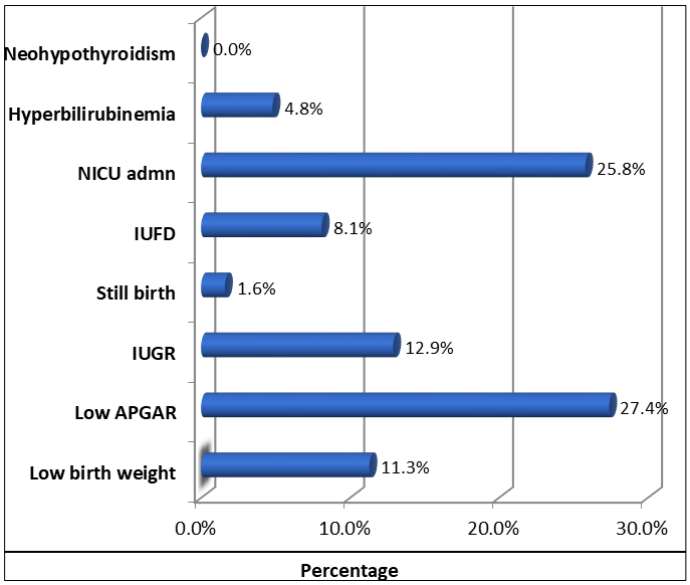

Graph 4: Fetal outcome among the hypothyroid study subject (n= 62)

Discussion

Thyroid disorders constitute one of the most common endocrine disorders in pregnancy. Pregnancy is associated with profound modifications in the regulation of thyroid function. These changes are the result of various factors like an increase of thyroxine-binding globulin (TBG) due to elevated estrogen and human chorionic gonadotropin (hCG), increased renal losses of iodine due to increased glomerular filtration rate, modifications in the peripheral metabolism of maternal thyroid hormones, and modification in iodine transfer to the placenta [1]. Fluctuation in thyroxine metabolism that occur during pregnancy may further impair maternal and fetal transfer of thyroxine despite apparently normal thyroid status. The Study is done to know the prevalence of hypothyroidism in antenatal women and adverse maternal and fetal outcome, to recommend universal screening for hypothyroidism in all antenatal women. The Prevalence of hypothyroidism in India ranges from 4.8-11% [7, 8, 13]. The prevalence of hypothyroidism among pregnant women in different states across India as per study conducted by Dhanwal *et al.* [8] is, Uttar Pradesh (Allahabad) - 15.66%, Karnataka (Bengaluru) - 7.8%, Haryana (Rohtak) - 19.4%, Tamil Nadu - (Chennai) 8.69%, West Bengal (Kolkata) - 11.76%, Telangana (Hyderabad) - 8.59%, Maharashtra (Nasik) - 14%, Delhi (New Delhi) - 16.21%, Maharashtra (Pune) - 17.85%, Kashmir (Srinagar) - 39%, Andhra Pradesh (Vizag) - 8.94%. In our study out of total 703 antenatal women screened 62 were hypothyroid. The most common age group screened were between 21-25 years. Out of 703 antenatal women screened 304 were primigravida, 399 were multigravida. The prevalence of hypothyroidism in the study is 8.8%, which is comparable to study done by Ajmani *et al.* [1] 12%, Anupama Dev *et al.* [5] 9.8%, Anitha *et al.* [9] 9.5%, Pavanaganga *et al.* [7, 4] 10.1%. Prevalence in primigravida 41.3%, 2nd gravid 19.4%, 3rd garvida 25.8%, 4th gravid 11.3% and 5th gravida 1.6%.

The recommended therapy is oral LT4 which should be given on empty stomach (45 min before consumption of food, beverages, or other medications). In addition, calcium, iron, and prenatal vitamins supplement should be avoided within 4 hours of ingestion of LT4, as these can decrease the absorption of thyroxine. In a typical case dose requirement goes up as pregnancy advances as pregnancy is a hypermetabolic condition. Immediately after delivery, the requirement of thyroxine drops and women who were taking thyroxine prior to pregnancy will shift to their pre pregnancy dose and those who started thyroxine in pregnancy will require half the dose they were taking just before the delivery. In women who had started

thyroxine in pregnancy for subclinical hypothyroidism, the medication can be stopped after delivery and thyroid balance re-assessed again after 6 weeks and decision taken regarding continuation of treatment.

Serum T3, T4 levels rise 30 minutes after delivery and persists for 5 days. This is due to TSH elevation caused be the stress of delivery. So new born screening should be done from cord blood or 5 days after delivery. The prevalence of hypothyroidism is more in the multigravida and increased prevalence is noted in second trimester. Prevalence is more in 36yrs to 40 years age group 25%, P value less than 0.05 which was statistically significant. Out of 703 antenatal women tested 04 patients lost follow up, 55 had history of abortion, in that 18 were hypothyroid 32.7%, which was statistically significant. The abortion rate in hypothyroid patients was 6.5% which is correlating with Ajmani Sangita *et al*. [1] 5.08%, Malavalli *et al*. [11] 7%, Vimal *et al*. [15] 7.35%. In our study preeclampsia in hypothyroid patients 27.4%, which is correlating with study done by Ajmani Sangita *et al*.[1] 22.3%, Pavanaganga *et al*. [14] 21.8%. In our study Oligohydramnios is 4.8%, which was correlating with study done by Pavanaganga *et al*. [14] 8.3%. In our study Abruptio placentae is 8.1%, which is correlating with study done by Ajmani Sangita *et al*. [1] 16.6%, Shobha *et al*.[2] 6.6%. In our study Preterm labour is 11.3%, which was correlating with study done by Ajmani Sangita *et al*. [1] 11.2%, Anitha *et al*. [9] 10.52%, Malavali *et al*. [11] 11%.

In present study GDM is 4.8%, which is correlating with study done by Pavanaganga *et al*. [14] 6.4%. In our study LSCS - Caesarean rate is 40.3%, which is correlating with study done by Sahu *et al*. [7] 52.3%, Anitha *et al*. [9] 36.84%. In present study PPH is 3.2%, which is correlating with study done by Ajmani Sangita *et al*. [1] 5.5%. LBW is 11.3%, which is correlating with study done by Anitha *et al*.[9] 15.78%, IUGR is 12.9%, which is correlating with study done by Sahu M T *et al*. [7] 13.8%, New born babies with low APGAR score is 22.5%, which is correlating with study done by Anitha *et al*. [9] 26.4%.Out of 62 hypothyroid women diagnosed, 25 were primigravida, 37 were Multigravida. 18 women had history of Abortion, 12 women were aged more than 30 yrs. shows relatively higher incidence of hypothyroidism with increasing age.

Prevalence of hypothyroidism is more in BMI of 25-30. High BMI group women had higher TSH concentration, and were prone to hypothyroidism than normal weight women. In our study 46.77% of hypothyroid patients were overweight. Obese women are at greater risk of complications such as longer operative period, excessive blood loss, wound infections and post-operative endometritis. In present study 30 - 40% of antenatal women screened did not have high risk factors and adverse fetal and maternal outcomes were noted.

The Endocrine society guidelines suggest that universal thyroid screening during pregnancy is recommended in only high-risk groups but our study shows that targeted case finding will miss around 30-40% of cases of Hypothyroidism. In a study done by Vaidya *et al*. [4] also showed that only targeted high risk cases screening will miss 30% of cases with hypothyroidism.

Universal screening for thyroid dysfunction should be recommended for all pregnant women, this will diagnose hypothyroidism at the earliest, and early initiation of treatment with levothyroxine can prevent complications like Abortion, Pre-eclampsia, Abruption placentae, Preterm delivery, IUGR, IUFD.

Limitations of the Study

Anti TPO Ab testing was not done because this test was not available in our institute. This study would have been more effective qualitatively and quantitatively if the estimation of serum Iodine was included along with TSH and free hormonal estimation.

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Prevalence of hypothyroidism

Study	No. of cases	Prevalence
Index study	703	8.8%
Anitha *et. al*	200	9.5%
Malavalli *et. al*	1200	4.16%
Vaidya *et. al*	1560	13%
Beta Matuszek *et. al*	270	10.4%
Anupama Dave *et. al*	305	9.8%
Shobha *et. al*	400	22.5%
Ajmani *et. al*	400	12%
Sahu *et. al*	633	6.4%
Pavanganaga *et. al*	1633	10.1%

Conclusion

In the present study prevalence of hypothyroidism is 8.8%, P value calculated is strongly significant for age and history of abortions. Thyroid screening is a must at first booking, ideally done prenatally to prevent miscarriages. As fetus needs thyroxine for brain development, growth, and lung maturation, adequate replacement therapy should be done to keep TSH within trimester specific reference ranges. Significant adverse effects on maternal and fetal outcome were seen emphasizing the importance of routine antenatal thyroid screening.

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