



## Hypothyroidism in Pregnancy: A Prevalence study in a Rural Medical College Hospital in North East Bihar

Authors

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### Abstract

*Hypothyroidism, especially subclinical Hypothyroidism, affects 3-5% of pregnant mothers. Beta-Human chorionic gonadotropin causes thyroid stimulation since the first trimester. This cross sectional, descriptive, observational study was conducted on 900 mothers in OBGYN dept. of MGM Medical College, Kishanganj for 2 years to find out its prevalence. The prevalence of hypothyroidism was found to be 4.89% (n=44) with subclinical hypothyroidism being 4.11% (n=37) and overt hypothyroidism being 0.78% (n=7). The prevalence of anaemia, hypertension, preeclampsia and gestational diabetes was also found to be statistically significant.*

**Keywords:** Hypothyroidism, Hyperthyroidism, Subclinical, TSH, Prevalence.

### Introduction

Hypothyroidism is the most common pregnancy-related thyroid disorder, affecting 3-5% of all pregnant women. Subclinical hypothyroidism is more common than the overt hypothyroidism and is usually defined as a serum thyroid-stimulating hormone (TSH) concentration greater than the pregnancy-specific reference range for each laboratory value, or by serum TSH concentrations greater than 2.5 mIU/L in the first trimester and greater than 3 mIU/L in the second and third trimesters and fT4 in the normal range. During pregnancy, an increase in levothyroxine dose is required in more than 50% of women with previously diagnosed hypothyroidism and can be managed by increasing the levothyroxine dose by 30% when pregnancy is confirmed.

Whereas about 2-3% of pregnant women are hypothyroid, of whom 0.3-0.5% have overt hypothyroidism and 2-2.5% present subclinical

hypothyroidism. Beta-Human chorionic gonadotropin causes thyroid stimulation since the first trimester, due to structural analogy with thyroid-stimulating hormone (TSH). The thyrotropic activity of alpha-hCG causes also a decrease in serum TSH in the first trimester so that pregnant women have lower serum TSH concentrations than nonpregnant women. The circulating levels of thyroid-binding globulin (TBG) are also increased, by estrogen stimulation. On the other hand, the increased renal clearance both fetal intake and placenta metabolism induce a relative decline in the availability of iodide the rise in TBG. The fetal thyroid begins concentrating iodine and synthesizing thyroid hormones after 12 weeks of gestation; before this time any request of thyroid hormones is supplied by maternal reserves, to promote the physiological fetal brain development. Maternal subclinical hypothyroidism during early pregnancy has been

shown to be associated with impaired neuropsychological development of children and several other adverse outcomes, including premature birth, pre-eclampsia, breech delivery, and increased fetal mortality. Klein et al. showed among 2000 pregnant women (at 15-18 wks of gestation) 2.5 % had TSH concentration above 6 mU/lt. Only 1/10 th of them had overt hypothyroidism. In another study, 2.2% among 1900 pregnant women had an elevated TSH (< 10 mU/L). FT4 tended to cluster near the lower limits of normal.

### Aims and Objectives

To estimate the prevalence of hypothyroidism in pregnancy in rural and semi urban population of Bihar in a tertiary care level hospital.

### Materials and Method

This study was conducted in the Department of Gynaecology and Obstetrics, in association with the Department of Biochemistry of MGM Medical College and LSK Hospital. Healthy women with uncomplicated single intrauterine gestation, in any trimester attending the antenatal outpatient department of our hospital were included in this study. This is a cross sectional, descriptive, observational study in a reference population of pregnant women. Study period was of two years, from October 2019 to September 2021.

Sample size was calculated by the formulae:  $(Za/2)^2 \times (\text{standard deviation})^2 / e^2$  (e= precision) – Total 900 mothers were studied, 300 in each of 3 trimesters.

### Exclusion Criteria

- 1) Pregnancy with multiple gestation, molar pregnancy, hyperemesis gravidarum.
- 2) Past history of spontaneous abortion.
- 3) Women suffering from chronic medical illness like asthma, inflammatory bowel disease, tumours, renal disease, other autoimmune diseases, diabetes mellitus.
- 4) Regular use of any medication other than iron and folate. History of blood borne

diseases like HIV, hepatitis B or C, syphilis, Impaired liver function tests, Impaired renal function tests, Impaired lipid profile.

The remaining population was divided into hypothyroid and euthyroid group according to the TSH and fT4 levels. The euthyroid population served as the control group.

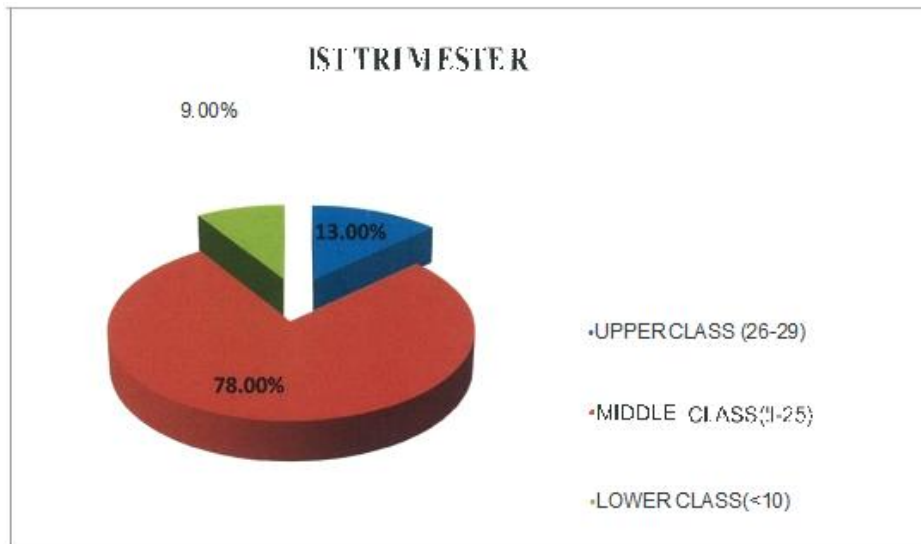
The prevalence of overt and subclinical hypothyroidism in pregnancy was measured by measuring the TSH and fT4 of all mothers. The values used to diagnose overt or subclinical hypothyroidism are: TSH (mIU/L) (Guidelines of the American Thyroid association for the diagnosis and management of thyroid disease during pregnancy and postpartum, {October 2011}): 1st trimester: 0.1-2.5, 2nd trimester: 0.2-3, 3rd trimester: 0.3. fT4 (ng/dl): 1<sup>st</sup> trimester: 1.13±0.23 (ng/dl), 2<sup>nd</sup> trimester: 0.92±0.3 (ng/dl), 3<sup>rd</sup> trimester: 0.86±0.21 (ng/dl). In subclinical hypothyroidism the TSH level is elevated but the fT4 is normal. In overt hypothyroidism both TSH and fT4 are elevated.

Demographic data was analysed by descriptive statistics. For comparison of parametric data students t-test, and for non-parametric data Mann-Whitney test was performed. Appropriate statistical software (Medcalc Version 12.3.0 [Mariakerke, Belgium: Medcalc Software 2012]) was used. Categorical data was analysed by chi-square or Fisher

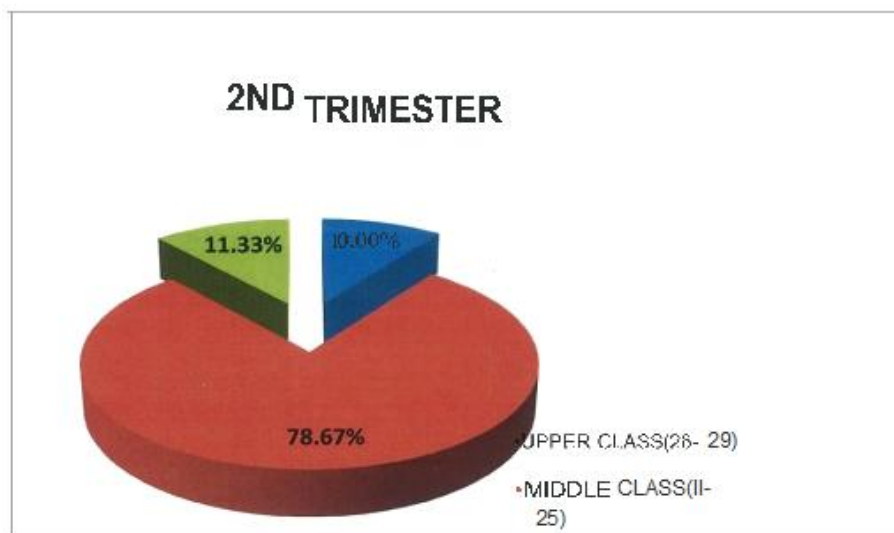
Exact Test as appropriate. By applying the formulae at each trimester, the sample size was calculated, 300 for each trimester. So, the total sample size was 900.

### Results

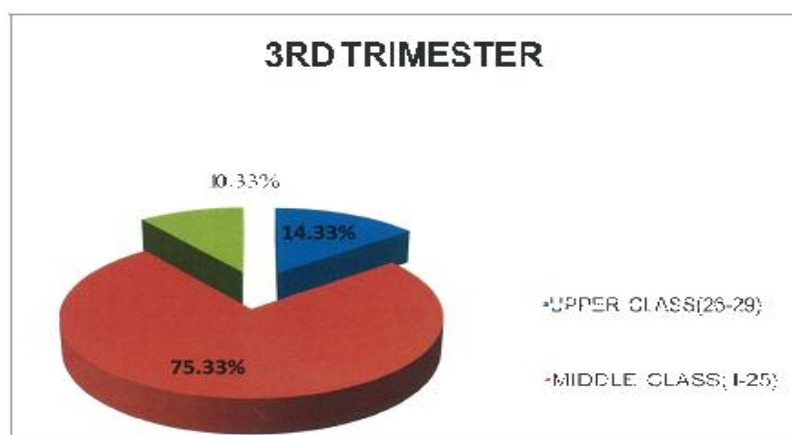
DEMOGRAPHIC DATA: The study subjects comprised of 900 pregnant mothers with 300 in each trimester. The percentage of primigravidae and multigravidae, and the distribution of population according to Kuppuswamy scale are represented in the tables and figures below. The age of the mothers varied from 18-35years.



**Figure 1** Distribution of Study Subjects in the First Trimester according to Kuppaswamy Scale 78%, 9% 13% of the mothers belonged to the middle, lower and upper class respectively.



**Figure 2:** Distribution of study Subjects in the Second Trimester according to Kuppaswamy Scale 78.67% of the mothers were in the upper class, 11.33% in the lower class and 10% in the upper class.



**Figure 3:** Distribution of study Subjects according to Kuppaswamy Scale in the Third Trimester 75.33% of the mothers was in the middle class, 14.33% was in the upper class and 10.33% was in the lower class.

The prevalence of hypothyroidism was found to be 4.89% (n=44) with subclinical hypothyroidism being 4.11% (n=37) and overt hypothyroidism being 0.78% (n=7). Prevalence of subclinical hypothyroidism in 1st 2nd and 3rd trimester was

4.33% (13), 3.33% (n= 10) and 4.67% (n=14) respectively. Prevalence of overt hypothyroidism was respectively 0.67% (n=2), 1.00%(n=3) and 0.78% (n=2) in 1<sup>st</sup>, 2nd, 3rd trimesters.

**Table 1.** Prevalence of Subclinical and Overt Hypothyroidism among Hypothyroid Subjects in the First, Second and Third Trimester of Pregnancy

Trimesters	Subclinical hypothyroidism	Overt hypothyroidism	Total
1st trimester	13(4.33%)	2(0.67%)	15(5.00%)
2nd trimester	10(3.33%)	3(1.00%)	13(4.33%)
3 <sup>rd</sup> trimester	14(4.67%)	2(0.67%)	16(5.33%)
Total	37(4.11%)	7(0.78%)	44(4.89%)

Among 900 mothers 2.00% (n=18) of hypothyroid mothers were primigravidae, 1.78% (n=16) of hypothyroid mothers were multigravidae. In euthyroid mothers the respective proportion being 47.78%(n=430) and 47.33%(n=426).

**Table 2** Distribution of study Subjects according to Gravidae

Gravidae	No. Of women With Hypothyroidism	No. of Euthyroid Women	Total
Primigravidae	18(2.00%)	430(47.78%)	448(49.78%)
Multigravidae	16(1.78%)	426(47.33%)	442(49.11%)
Total	44(4.89%)	856(95.11%)	900(100.00%)

Total 9(3%) of hypothyroid and 78(26.00%) of euthyroid mothers were primigravidae.

Total 6(2.00%) hypothyroid and 207(69.00%) of euthyroid mothers were multigravidae.

**Table 3.** Distribution of Mothers according to gravidae in the First Trimester of Pregnancy

Pregnant Women	Thyroid Status		Total
	Hypothyroid	Euthyroid	
	No(%)	No(%)	
No. Of Primigravidae	9(3.00%)	78(26.00%)	87 (29.00%)
No. Of Multigravidae	6(2.00%)	207(69.00%)	213 (71.00%)
Total	15(5.00%)	285(95.00%)	300(100.00%)

Total 8(2.67%) of hypothyroid and 171(57%) of euthyroid mothers were primigravidae. Total 5(1.67%) of hypothyroid and 116(38.67%) of euthyroid mothers were multigravidae.

**Table 4.** Distribution of Mothers According to gravidae in the Second Trimester

Pregnant Women	Thyroid Status		Total
	Hypothyroid	Euthyroid	
	No(%)	No(%)	
No. Of Primigravidae	8(2.67%)	171(57.00%)	179(59.67%)
No. Of Multigravidae	5(1.67%)	116(38.67%)	121(40.33%)
Total	13(4.33%)	287(95.67%)	300(100.00%)

Total 11(3.67%) of hypothyroid and 181 (60.33 %) of euthyroid mothers were primigravidae. Total 5(1.67%) of hypothyroid and 103(34.33%) of euthyroid mothers were multigravidae.

**Table 5.** Distribution of mothers according to Gravidae In the third Trimester of Pregnancy

Pregnant Women	Thyroid Status		Total
	Hypothyroid	Euthyroid	
	No(%)	No(%)	
No. Of Primigravidae	11(3.67%)	181(60.33%)	192(64.00%)
No. Of Multigravidae	5(1.67%)	103(34.33%)	108(36.00%)
Total	16(5.33%)	284(94.67%)	300(100.00%)

In the hypothyroid population 46.67% were primigravidae with subclinical hypothyroidism, 6.67% were primigravidae with overt hypothyroidism, 40% were multigravidae with subclinical hypothyroidism, 6.67% were multigravidae with overt hypothyroidism.

**Table 6** Distribution of subclinical and Overt Hypothyroid Mothers according to Gravidae in First Trimester

Pregnant Women	Thyroid Status		Total
	Subclinical Hypothyroidism	Overt Hypothyroidism	
	No(%)	No(%)	
No. of Primigravidae	7(46.67%)	1(6.67%)	8 (53.33%)
No. Multigravidae	6(40.00%)	1(6.67%)	7 (46.67%)
Total	13(86.67%)	2(13.33%)	15 (100.00%)

Among the hypothyroid mothers, 6(46.15%) were primigravidae with subclinical hypothyroidism, 2(15.38%) were primigravidae with overt hypothyroidism, 4 (30.76%) were multigravidae with subclinical hypothyroidism, 1(7.70%) was multigravidae with overhypothyroidism.

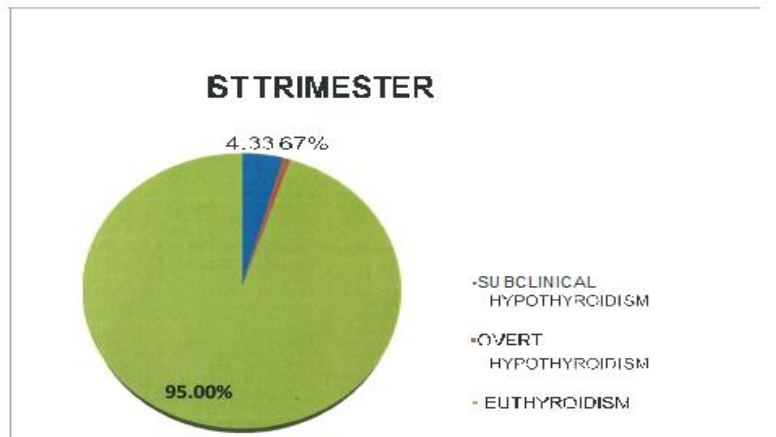
**Table 7.** Distribution of Subclinical and overt Hypothyroid Mothers according to Gravidae in Second Trimester

Pregnant Women	Thyroid Status		Total
	Subclinical Hypothyroidis	Overt Hypothyroidism	
	No(%)	No(%)	
No. of Primigravida	6(46.15%)	2(15.38%)	8(61.54%)
No. of Multigravidae	4(30.76%)	1(7.70%)	5(38.46%)
Total	10(76.92%)	3(23.07%)	13(100.0%)

Among the hypothyroid mothers, 6(37.5%) were primigravidae with subclinical hypothyroidism, 1(6.25%) were primigravidae with overt hypothyroidism, 8(50%) were multigravidae with subclinical hypothyroidism, 1(6.25%) was mutigravidae with overt hypothyroidism.

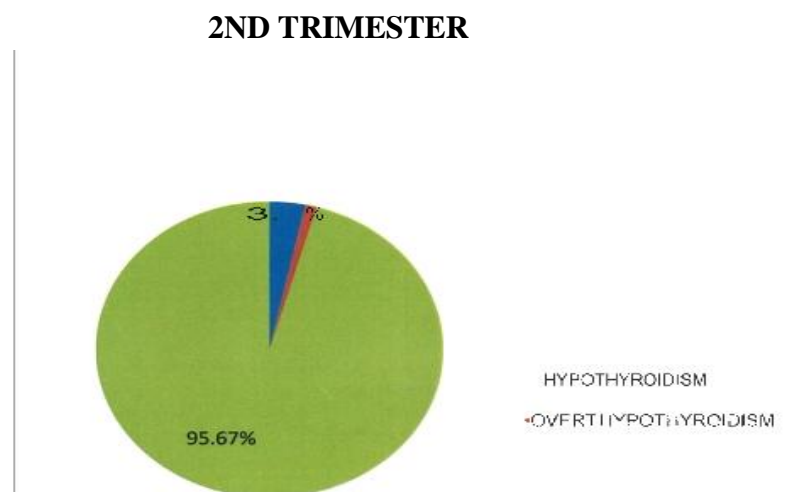
**Table 8** Distribution of Subclinical And Overt Hypothyroid Mothers according to Gravidae in the Third Trimester

Pregnant Women	Thyroid Status		Total
	Subclinical Hypothyroidism	Overt Hypothyroidism	
	No(%)	No(%)	
No. Of Primigravidae	6(37.5%)	1(6.25%)	7(43.75%)
No. Of Multigravidae	8(50.00%)	1(6.25%)	9(56.25%)
Total	14(87.50%)	2(12.50%)	16 (100.00%)



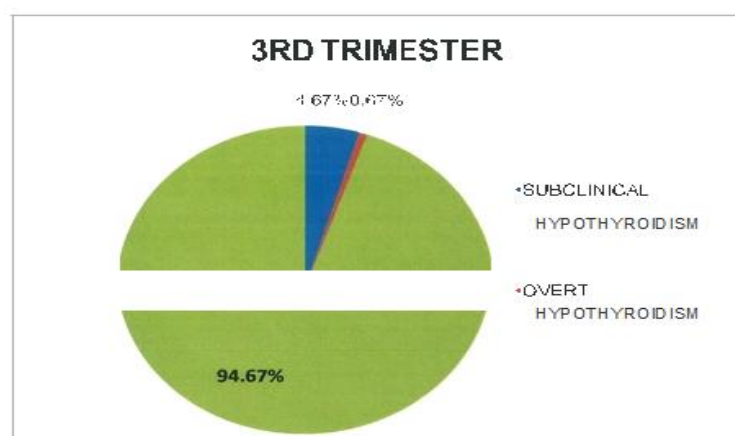
**Figure 4:** Distribution of study subjects in the First Trimester of Pregnancy according to levels of Thyroid Hormone

The prevalence of euthyroid, subclinical hypothyroid and overt hypothyroid mothers in first trimester was 95%, 4.33% and 0.67%.



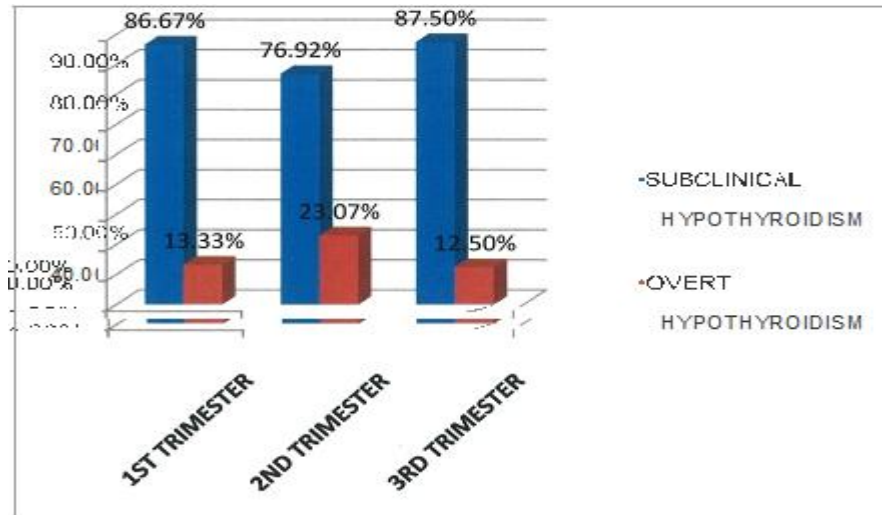
**Figure 5:** Distribution study Subjects according to the levels of Thyroid Hormone in the second trimester of Pregnancy

Prevalence of euthyroidism, subclinical hypothyroidism and overt hypothyroidism in the second trimester of pregnancy was 95.67%, 3.33% and 1%.



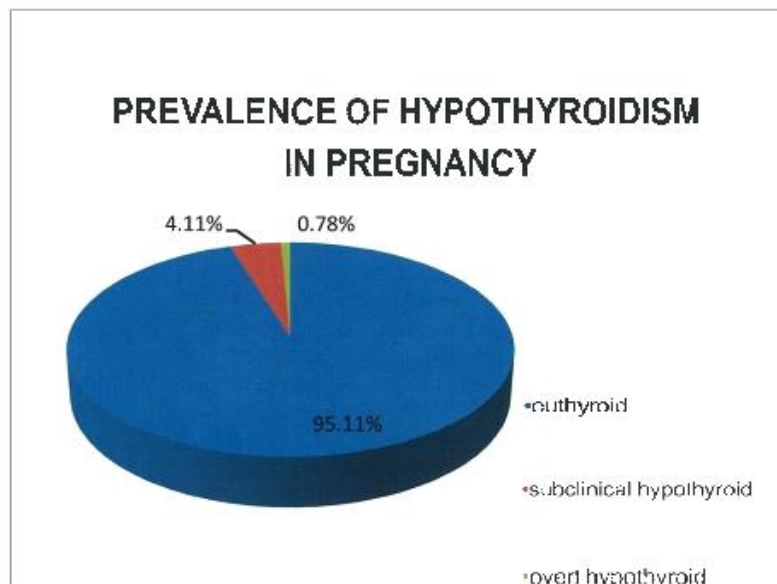
**Figure 6:** Distribution of Study Subjects according to levels of Thyroid Hormone in the Third Trimester of Pregnancy

Prevalence of euthyroid, subclinical hypothyroid and overt hypothyroid mother in the third trimester was 94.67%, 4.67% and 0.67%.



**Figure 7:** Distribution of Hypothyroid Subjects in the First, Second and Third Trimester According to Subclinical and Overt Status

In the hypothyroid population the prevalence of subclinical hypothyroidism in the 1st, 2nd and 3rd trimester was 86.67%, 79.92% and 87.50%; the prevalence of overt hypothyroidism was 13.33%, 23.07% and 12.50%.



**Figure 8:** Prevalence of Hypothyroidism in pregnancy

Prevalence of euthyroid, subclinical hypothyroid and overt hypothyroid in pregnancy was 95.11%, 4.11% and 0.78%. The prevalence of hypothyroidism in pregnancy in the study subjects is calculated to be 4.89%. The prevalence of subclinical hypothyroidism is 4.11% and 0.78% for overt hypothyroidism.

**Discussion**

The prevalence of hypothyroidism was 4.89%. prevalence subclinical and overt hypothyroidism was calculated to be 4.11% and 0.78%. the prevalence of hypothyroidism in first, second and third trimester are respectively 5%, 4.33% and 5.33%.

The prevalence of underweight, normal,

overweight, and obese individuals in the euthyroid group were 1.63%, 83.53%, 12.38% and 2.45% respectively. The prevalence of underweight, normal, overweight, and obese individuals in the hypothyroid group were 0%, 61.36%, 31.81% and 6.81% respectively. Hypothyroidism was associated with increased BMI and that was statistically significant.

The prevalence of anaemia in euthyroid and hypothyroid group were 50.93% and 38.63%. The prevalence of anaemia in subclinical and overt group were respectively 42.85% and 37.83%. The prevalence of hypertension in the euthyroid and hypothyroid group was 19.62% and 27.27% respectively. The prevalence of preeclampsia in the euthyroid and hypothyroid group was 4.9% and 20.69% respectively. The correlation between hypothyroidism and gestational diabetes was statistically significant ( $p < 0.002$ ). The correlation of hypothyroidism was more with subclinical ( $p < 0.0011$ ) than overt ( $p = 0.0796$ ).

### Conclusion

Adequate thyroid function is essential for the normal foetal growth and maintenance of normal maternal physiology. The prevalence of hypothyroidism in pregnancy was calculated to be 4.89% with subclinical hypothyroidism being 4.11% and overt hypothyroidism being 0.78%. There was statistically significant positive association between hypothyroidism and pre-pregnancy BMI, pre-eclampsia and gestational diabetes. This study emphasises the importance of screening for hypothyroidism and further research in association of hypothyroidism with BMI, anaemia, hypertension, pre-eclampsia, and gestational diabetes, so that the affected mothers may be treated during pregnancy and afterwards to avoid possible foetal complications.

### Limitations

- (i) The study has been done in a single centre; hence the generalization is not possible.
- (ii) The sample size was small. Randomized Control Studies (RCTs) with larger number of patients are needed to verify the findings and come to a definite conclusion.
- (iii) Sample size including different ethnic groups would have been better.

**Conflicts:** There were no conflicts in this study.

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