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Original Research Article

## Prevalence of pregnancy induced thyroid disorders, diabetes and hypertension in a tertiary care teaching hospital: an observational study

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### ABSTRACT

**Background:** Pregnancy induced thyroid disorders, gestational diabetes mellitus (GDM) and gestational hypertension are common problems in women with gestational period. Published literature shows wide range of prevalence in pregnancy induced disorders in other states of India, and as of now the exact prevalence in our study population is not studied. Hence, the present study was aimed to know the prevalence of pregnancy induced disorders in pregnant women in South Indian population.

**Methods:** A total of 120 subjects were followed-up at the time of recruitment to entire gestational period. Standard guidelines were followed for the assessment of thyroid hormone levels, glucose tolerance test (OGTT) and blood pressure values at different intervals and positions. Apart from detailed clinical history has been taken and routine basic and obstetrical investigations were done.

**Results:** Prevalence of thyroid dysfunction (15.0%), gestational diabetes mellitus (11.7%) and gestational hypertension (9.2%) was reported in the present study population. Subclinical hypothyroidism was highest prevalence amount thyroid disorders. Gestational diabetes subjects have mean blood glucose levels of  $230.68 \pm 17.48$  mg/dL with OGTT test. Gestational hypertensive patients had SBP of  $152.4 \pm 10.8$  and DBP of  $96.6 \pm 6.4$ ; pre-hypertensive subjects had SBP of  $134.2 \pm 5.48$  and DBP of  $6.8 \pm 4.6$  respectively.

**Conclusions:** Our study findings were slightly higher than normal prevalence's which are reported earlier by various authors. We suggested that early screening, diagnosis and treatment are warranted for the prevention of maternal and fetal complications in Indian population.

**Keywords:** Diabetes, Hypertension, Observational study, Pregnancy, Thyroid disorders

### INTRODUCTION

Pregnancy induced thyroid disorders, diabetes and hypertension are the common endocrine and cardiovascular disorders seen maternally either in early and late period of pregnancy. Maternal thyroid dysfunction contributes many risk factors which includes increase thyroglobulin levels, renal excretion of iodine due to increased rate of glomerular filtration, alterations

in thyroid hormone peripheral metabolism and modifications in iodine transfer to placenta.<sup>1</sup> Iodine requirement increases by 50% during gestation period which can be compensated with synthesis and production of maternal thyroid hormones from gland and 10% increase in gland size is estimated.<sup>2</sup> Pregnancy is a stress factor for thyroid gland which resulting in hypothyroidism with dietary iodine deficiency and very limited thyroidal reserve women. Early pregnancy

induced thyroid dysfunction has been associated with maternal complications such as abortion, preterm labour, pre-eclampsia, eclampsia and the fetal complications are low birth weight, prematurity, still birth and perinatal death.<sup>3</sup> Women has hypothyroidism in 1<sup>st</sup> trimester of pregnancy is very harmful for brain development of fetus which leads to mental retardation, cretinism, physical growth and development impairment and most organ systems will be affected. Postnatal complications are impaired intellectual development, attention deficit and hyperactivity syndrome and respiratory distress syndrome.<sup>4</sup>

Incidence of gestational diabetes mellitus (GDM) varies globally from 2% to 14%.<sup>5</sup> Gestational diabetes can cause complications to mother as well as fetus. Maternal complications include pre-eclampsia, placental abruption, needing to induce labour. Fetal complications are premature birth, macrosomia, trauma during the birth, neonatal hypoglycaemia, perinatal death.<sup>6,7</sup>

Gestational hypertension also referred to as pregnancy induced hypertension (PIH) is a condition characterized by high blood pressure during pregnancy. Hypertension during pregnancy affects about 6-8% of pregnant women.<sup>8</sup> Gestational hypertension can lead to a serious condition called preeclampsia usually begins after 20 weeks of pregnancy and usually goes away after childbirth. Complications of preeclampsia may include fetal growth restriction, preterm birth, placental abruption, HELLP syndrome, eclampsia and cardiovascular diseases.<sup>9-11</sup>

Preeclampsia develops only as a complication of pregnancy. Risk factors are history of preeclampsia, chronic hypertension, first pregnancy, maternal age (>30), obesity, multiple pregnancy, in-vitro fertilization and history of certain conditions such as migraines, type 1 or type 2 diabetes, kidney diseases.<sup>12-14</sup>

Therefore, this study was carried out in pregnant women with entire gestation period during who attended antenatal clinic of Department of Obstetrics and Gynecology, Maharaja Institute of Medical Sciences, Vijayanagaram, Andhra Pradesh to know the prevalence of pregnancy induced thyroid disorders, diabetes and hypertension.

## **METHODS**

A prospective, observational study was conducted at Department of Obstetrics and Gynecology, Maharaja Institute of Medical Sciences, Vijayanagaram, Andhra Pradesh during the period of January 2018 to March 2019. The present study was approved by scientific committee as well as Institutional Ethics Committee and Informed consent was obtained from all of the study participants. Study was conducted according to the Declaration of Helsinki.

Study participants were recruited during their routine antenatal OPD visits during first trimester of pregnancy and followed-up entire gestational period (40 weeks) up to delivery. After confirmation of gestational age, a total of 150 subjects who are in first trimester were randomly selected and included for the study.

### **Inclusion criterion**

- Primigravida pregnancy/multigravida pregnancies
- <24 weeks of gestational age
- Singleton pregnancy.

### **Exclusion criteria**

- >37 weeks of gestational age
- Multifetal gestation
- Known case of chronic disorders (thyroid dysfunction, diabetes, hypertension and PCOS).

A detailed clinical history was obtained by using predesigned data collection sheet.

Clinical history regarding menstrual history, obstetric history, family history, personal and social history, symptoms of thyroid disorders, diabetes and hypertension was recorded. General examination was carried out during the OPD visits which includes body temperature, pulse rate, blood pressure, respiratory rate, per abdominal and per vaginal examination was also done and findings were recorded.

### **Investigations**

Pregnancy was confirmed by ultrasonography and clinical assessment. Blood samples were collected once in every 3 months (last week of trimester) for assessing thyroid profile (TSH, FT3, FT4 levels); fasting blood glucose levels, OGTT were conducted for diagnosis of gestational diabetes; two different points and position blood pressure were measured for the diagnosis of gestational hypertension. Basic investigations including complete blood picture, blood grouping and Rh typing, serum creatinine, HIV, Hbs Ag and complete urine examination were done.

### **Classification**

#### *Thyroid disorders*

American Thyroid Association (ATA) for the Diagnosis and Management of Thyroid Disease during Pregnancy and Postpartum guidelines was followed.<sup>3</sup>

*The normal references for TSH ranges according to ATA are:*

- First trimester - 0.1 to 2.5 mIU/L
- Second trimester - 0.2 to 3.0 mIU/L

Third trimester - 0.3 to 3.0 mIU/L

Normal free T4 level is 0.7 to 1.8 ng/ml and free T3 level is 1.7 to 4.2 pg/ml.

Subjects were classified into different clinical forms based on the obtained hormonal values

*Subclinical hypothyroidism*

High serum TSH level with normal fT4, fT3 level

*Overt hypothyroidism*

High serum TSH level with fT4 and fT3 less than normal range

Subclinical hyperthyroidism: Low serum TSH level with normal fT3, fT4 level

*Overt hyperthyroidism*

Low serum TSH level with fT3 and fT4 more than normal range

**Gestational diabetes**<sup>6-15</sup>

For the diagnosis of gestational diabetes, oral glucose tolerance test (OGTT) was performed in several steps.

**Diagnostic test**

Study subject had taken about 8 ounces (237 milliliters) of a syrupy glucose solution containing 2.6 ounces (75 grams) of sugar by oral route. Two hours later, blood glucose level was measured.

*Two hours after drinking the glucose solution*

- A normal blood glucose level is lower than 140 mg/dL (7.8 mmol/L)
- A blood glucose level between 140 and 199 mg/dL (7.8 and 11 mmol/L) is considered impaired glucose tolerance, or prediabetes
- A blood glucose level of 200 mg/dL (11.1 mmol/L) or higher may indicate diabetes.

**Gestational hypertension**

It is defined as systolic blood pressure (SBP) >140 mmHg and diastolic blood pressure (DBP) >90 mmHg.

**Classification**

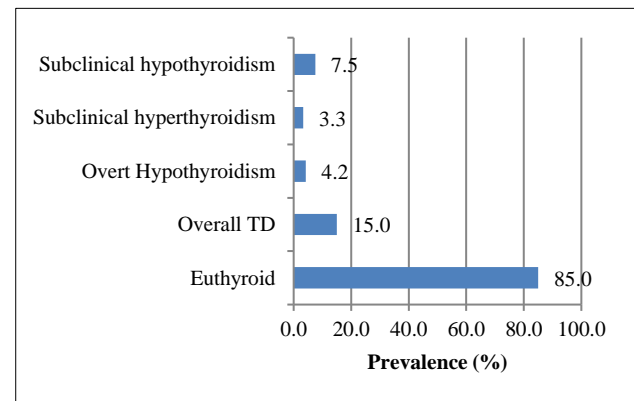
- Mild (SBP 140-149 and DBP 90-99 mmHg)
- Moderate (SBP 150-159 and DBP 100-109 mmHg)
- Severe (SBP ≥ 160 and DBP ≥ 110 mmHg).

**RESULTS**

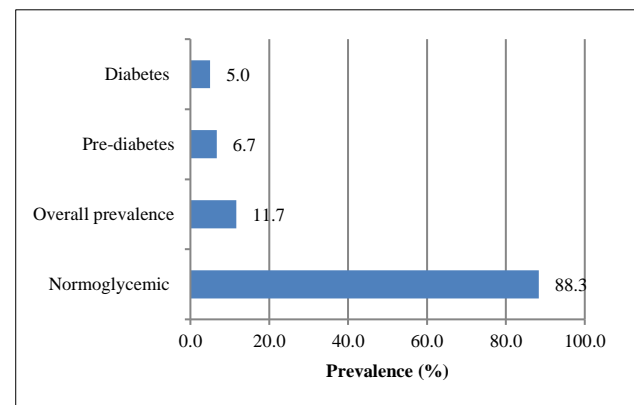
A total of 150 study subjects were recruited and 120 subjects completed entire study. Maternal demographic characteristics of study population are shown in Table 1. A total of 78.3% of study subjects were between the age group of 21-30 years. All subjects are fall within the normal BMI range and mean gestational age of 8.4 weeks.

**Table 1: Baseline characteristics of maternal study population.**

Characteristic	Number (Mean±SD)
<b>N</b>	<b>120</b>
Age in years	25.18±5.42
≤20, n (%)	10 (8.3)
21-25, n (%)	46 (38.3)
26-30, n (%)	48 (40.0)
>30, n (%)	16 (13.3)
Range	19-32
Height in cm	167.6±12.8
Weight in kg	53.8±7.3
BMI	19.0±2.8
Gestational age in weeks	8.4±2.9



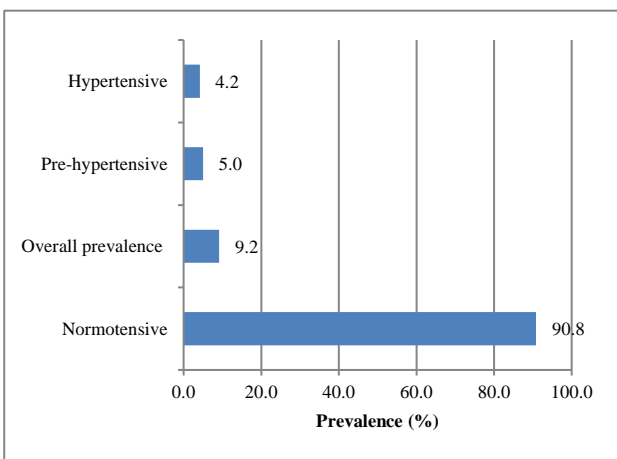
**Figure 1: Prevalence of pregnancy induced thyroid disorders in study population.**



**Figure 2: Prevalence of pregnancy induced diabetes in study population.**

**Table 2: Serum thyroid hormone levels, blood glucose levels and blood pressure values of study population in the present study.**

Pregnancy induced thyroid dysfunction				
Category	Euthyroid (n=102)	Overt hypothyroidism (n=05)	Subclinical hyperthyroidism (n=04)	Subclinical hypothyroidism (n=09)
TSH (mIU/L)	1.61±0.38	4.62±1.68	0.03±0.00	3.22±0.41
T3 (pg/ml)	2.41±0.46	0.72±0.06	2.66±0.61	2.86±0.38
T4 (ng/ml)	1.28±0.36	0.31±0.16	1.61±0.24	1.12±0.28
Pregnancy induced diabetes mellitus				
	Normoglycemic (n=106)	Pre-diabetes (n=08)	Diabetes (n=06)	
Blood glucose levels (mg/dL), After 2 hours	126.12±11.28	168.72±16.86	230.68±17.48	
Pregnancy induced hypertension				
	Normotensive (n=109)	Pre-hypertensive (n=06)	Hypertensive (n=05)	
SBP/DBP (mmHg) Position 1	122.8 ±6.8/ 84.2±4.8	134.2±5.4/ 86.8±4.6	152.4±10.8/ 96.6±6.4	
SBP/DBP (mmHg) Position 2	124.2±6.4/ 86.4±5.0	134.8±5.6/ 86.6±4.8	156.2±11.0/ 98.6±6.8	

**Figure 3: Prevalence of pregnancy induced hypertension in study population.**

A total of 18 (15.0%) subjects had pregnancy induced thyroid dysfunctions (Figure 1) in which overt hypothyroidism (4.2%), subclinical hyperthyroidism (3.3%) and subclinical hypothyroidism (7.5%) was the highest. A total of 8 (6.7%) subjects had pre-diabetes and 6 (5.0%) subjects had diabetes in the study population. (Figure 2) Gestational diabetes subjects have mean blood glucose levels of 230.68±17.48 mg/dL with OGTT test (Table 2). A total of 5 (4.2%) subjects had gestational hypertension and 6 (5.0%) had pre-hypertension. (Figure 3) Hypertensive patients had SBP of 152.4±10.8 and DBP of 96.6±6.4; pre-hypertensive subjects had SBP of 134.2±5.48 and DBP of 6.8±4.6 respectively (Table 2).

## DISCUSSION

The prevalence of thyroid disorders in the present study was 15.0%. A study conducted by Sahu MT et al, studied on 633 pregnant women in second trimester and reported that prevalence of thyroid disorders was 12.7%, slightly lower than the present study and these findings are comparable and inconsistent.<sup>16</sup> Another study conducted by Pahwa S et al, studied on 100 women with first trimester of pregnancy and reported 10.0% of thyroid dysfunction prevalence<sup>1</sup>. The prevalence of subclinical hypothyroidism in the present study is 7.5%. This finding is inconsistent with Sahu MT et al study which was showed 6.47% and Pahwa S et al, study showed 6.0%. The present study finding was in contrast to Casey BM et al, study showed very less prevalence of 2.3%.<sup>17</sup>

The prevalence of overt hypothyroidism in present study is 4.2% which is almost inconsistent with Sahu MT et al, study reported 4.58% prevalence and our study finding is in contrast to Pahwa S et al, study had reported only 2.0%.<sup>1,16</sup> The prevalence of subclinical and overt hyperthyroidism in our study is 3.3% and Nil respectively. Our findings are in contrast to Sahu MT et al, study which was reported 0.9% and 0.7% for subclinical and overt hyperthyroidism respectively. Another study conducted by Stagnaro Green A et al, and reported very low prevalence of subclinical hyperthyroidism (0.5%).<sup>18</sup> Sub clinical/ overt hypothyroid cases were treated with oral thyroxine sodium and sub clinical / overt hyperthyroid cases were treated with oral propylthiouracil.

No specific recommendations are available for detection and screening of thyroid dysfunction in Indian pregnant population. Current Indian guidelines are recommending thyroid hormones level estimation only for high risk women with personal history of thyroid or other autoimmune disorders or with a family history of thyroid disorders. The present study had showed high prevalence rate of thyroid disorders especially subclinical and overt hypothyroidism among Indian pregnant women.

A total of 6.7% and 5.0% subjects had pre-diabetes and diabetes respectively in the present study. Single point OGTT was conducted and blood glucose levels were estimated after two hours ( $230.68 \pm 17.48$  mg/dL). Kaiser Permanente health system studies assessed the incidence rates of GDM in pregnant women of multiple ethnicities. Both these studies had reported that people of Asian ethnicity has higher incidence. The overall incidence rate of GDM was 10%, with higher rates in Asian (17%) and Hispanic (11%) women and lower rates in non-Hispanic white (7%) and black (7%) women.<sup>19,20</sup> Bryson CL et al, conducted a study and reported that gestational diabetes was more common in each case group of 3.9% in eclamptics, 4.5% in severe preeclampsics, and 4.4% in both mild preeclampsics and those with gestational hypertension.<sup>21</sup> Gestational diabetes and pregnancy-induced hypertension are common, and their relation is not well understood. Hypertensive disorders are more with women have GDM and even high risk of diabetes mellitus after gestation period.<sup>22</sup> Early diagnosis and treatment of GDM can reduce perinatal complications, but only a small fraction of pregnancies benefit.<sup>23</sup> Dietary management, insulin, metformin and other newer oral anti-diabetic drugs are used to intensify treatment.<sup>24</sup>

A total of 4.2% and 5.0% subjects had gestational hypertension and pre-hypertension in the present study. Blood pressure was collected at two different internals of two different positions of pregnant women. Hypertensive patients had SBP of  $152.4 \pm 10.8$  and DBP of  $96.6 \pm 6.4$ ; pre-hypertensive subjects had SBP of  $134.2 \pm 5.48$  and DBP of  $6.8 \pm 4.6$  respectively. Mehta B et al, conducted a study on pregnant women and reported 6.9% of prevalence.<sup>25</sup> Sachdeva et al, conducted study in Gujarat, reported 15.0% of the incidence of pregnancy-induced hypertension among women of rural background.<sup>26</sup> Several hospital-based studies in India have reported various prevalence rates which includes 7.49, 5.38, and 8.96% respectively.<sup>27</sup>

Non-drug management is recommended when SBP ranges between 140-149 mmHg and DBP between 90-99 mmHg. Blood pressure thresholds for drug management in pregnancy vary between different health organizations. According to 2013 ESH/ESC guidelines, antihypertensive treatment is recommended in pregnancy when blood pressure levels are  $\geq 150/95$  mmHg. Initiation of antihypertensive treatment at values  $\geq 140/90$  mmHg is recommended with gestational hypertension.<sup>28-29</sup>

## CONCLUSION

The present study reported the prevalence of thyroid dysfunction (15.0%), gestational diabetes mellitus (11.7%) and gestational hypertension (9.2%) in the study population. These findings are slightly higher than normal prevalence's which are reported earlier by various authors. The present findings were suggested that early screening, diagnosis and treatment are warranted for the prevention of maternal and fetal complications in Indian population. The knowledge of risk factors for hypertensive disorders in pregnancy may give tracks for prevention in this population. Therefore, it is the need of hour to advice early screening strategy to find out pregnancy induced disorders.

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