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Original Research Article

Assessment of Thyroid Dysfunction in Women with Normal Vs Preeclampsia Pregnancy: A Case Control Study

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Conflict of interest: Nil

Abstract:

Introduction: Thyroid dysfunction has impending effect during pregnancy on both the mother and the fetus. Preeclampsia is a possible pregnancy-related complication in women with hypothyroidism. Th present study was aimed to assess the prevalence of hypothyroidism in the women with preeclampsia.

Material and Methods: A total of 94 cases with preeclampsia between 18-35 years and age and gestational age matched control subjects belonged to >20 weeks were recruited. 5 ml of peripheral venous blood was collected to analyse free T3, free T4 and TSH levels.

Results: The prevalence of hypothyroidism was 40.43% in women with preeclampsia. The TSH levels were comparatively high in women with severe preeclampsia than mild preeclampsia and levels of FT3, FT4 and TSH were comparatively high in preeclamptic women with >34 weeks of gestation. The number of antihypertensive drugs intake was significantly reduced after delivery in women with preeclampsia.

Conclusion: Hypothyroidism was substantially correlated with the severity of preeclampsia. Women with conditions including obesity, diabetes, hypertension, and TSH should keep track of their levels regularly to prevent hypothyroidism, which can cause preeclampsia and have an effect on both the mother and the foetal outcome.

Keywords: Preeclampsia, Hypothyroidism, Pregnancy, Thyroid stimulating hormone.

Introduction

Thyroid dysfunction is one of the most common endocrine disorders encountered during pregnancy. Thyroid hormone imbalance can influence the neonatal and maternal outcome [1]. In India, pregnant women had a 4.8% to 11% prevalence of hypothyroidism [2]. Preeclampsia causes a five-fold increase in perinatal mortality and is the primary cause of maternal mortality in poor nations [3]. Preeclampsia occurs in 16.7% of subclinical instances and 43.7% of overt hypothyroidism, disrupting 2-8% of pregnancies [4, 5]. Thyroid hormone levels rise all through pregnancy by 40–100% to meet fetomaternal needs. Thyroid Stimulating Hormone (TSH) rises in a healthy pregnancy as a result of an increase in Human Chorionic Gonadotropin (HCG) concentration [6]. Free Triiodothyronine and Free Thyroxine (FT3 and FT4) rise more slowly than Total Thyroxine (TT4) and Total Triiodothyronine (TT3) concentrations [7]. The thyroid gland is one of the organs that is impacted by preeclampsia [8]. It is frequently disputed how thyroid hormone levels and preeclampsia are related. A small number of studies reported that preeclamptic women did not experience any alterations as a result of elevated thyroid hormone levels [9]. Preeclampsia and normal pregnancy in women are not significantly related, according to other studies [10]. Few studies specified that the preeclamptic women had higher incidence of the increase in TSH and low T4 in a comparison with normal pregnant women [11]. In light of the aforementioned literature, the current study's goal was to determine the prevalence of hypothyroidism in preeclampsia patients.

Material and Methods

The present cases control study was conducted in the department of General Medicine in association with Department of Obstetrics and gynaecology at MNR Medical College and Hospital, Sangareddy during April 2022 to April 2023. A total of 94

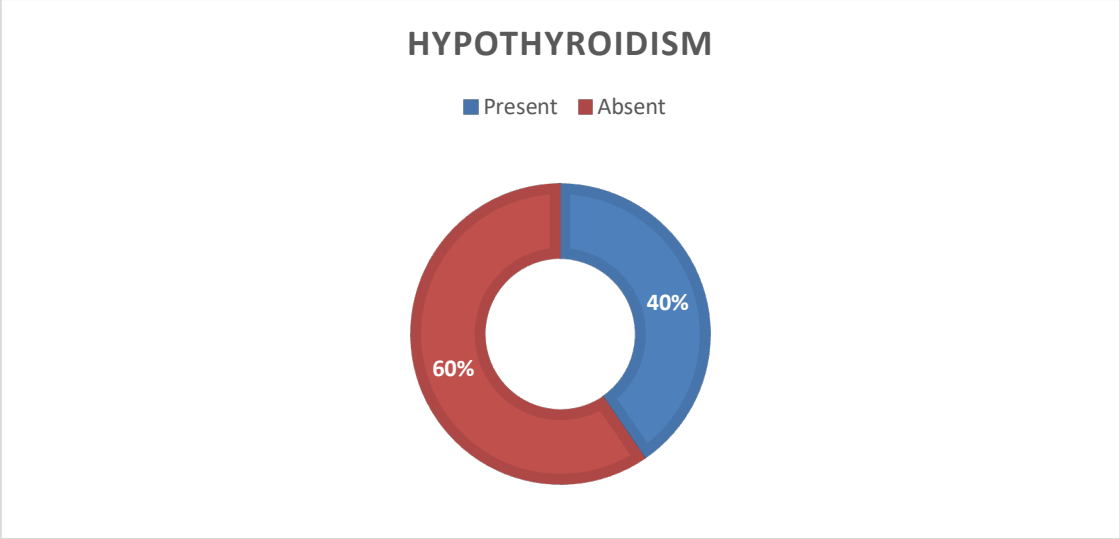
cases with preeclampsia between 18-35 years and similar number age and gestational age matched control subjects were recruited. Cases with >20 weeks of gestation, recent onset hypertension, proteinuria, diagnosed as preeclampsia and willing to participate were included. Cases with <20 weeks of gestation, with gestational hypertension, thyroid disorders, diabetes mellitus, obesity, cardiovascular complication, renal diseases, and not willing to participate were excluded. Written informed consent was obtained from all the study participants and study protocol was approved by institutional ethics committee. All of the participants' sociodemographic information, medical, and obstetric histories were gathered. 5 ml of peripheral venous blood was collected to analyse the thyroid hormone (ET3, FT4 and TSH) by using chemiluminescent assay. By evaluating thyroid function, people who were discovered to have hypothyroidism were evaluated to determine whether it was subclinical or overt hypothyroidism. At each visit, blood pressure was taken to determine whether antihypertensive medication was necessary.

Collected data was analysed by using SPSS version 23.0. Categorical variables were expressed in the form of frequency and percentage. Continuous variables expressed with mean and standard deviation. Chi-square test was used to compare the association between study variables. P<0.05 was considered as statistical significance.

Results

Table 1: Socio-demographic and clinical profile of study participants.

Parameter	Cases (n=94)		Controls (n=94)		Chi-square value	P-value
	Frequency	Percentage	Frequency	Percentage		
Sociodemographic details						
Age (In years)						
18-25	18	19.15%	22	23.4%	2.98	0.0614
26-30	49	52.12%	45	47.88%		
31-35	27	28.72%	27	28.72%		
BMI (kg/m^2)						
≤25	18	19.35%	59	62.77%	**6.11**	**0.001**
26-30	40	42.55%	24	25.54%		
>30	36	38.30%	11	11.70%		
Residence						
Urban	24	25.54%	27	28.72%	4.02	0.762
Rural	70	74.46%	67	71.28%		
Educational status						
Primary school	11	11.70%	15	15.96%	18.32	0.0853
High school	18	19.15%	18	19.14%		
Intermediate	29	30.85%	30	31.92%		
Graduation & above	36	38.29%	31	32.98%		
Occupation						
Daily labour	05	5.32%	09	9.57%	4.30	0.0841
House wife	60	63.83%	56	59.58%		
Skilled	20	21.28%	18	19.15%		
Semi-skilled	09	9.57%	11	11.70%		
Clinical profile						
Onset of preeclampsia						
<34 weeks	**24**	25.54%	-		-	-
>34 weeks	**70**	74.46%	-			
Severity of preeclampsia						
Mild	**35**	**37.23%**	-		-	-
Severe	**59**	**62.77%**	-			
Gestational age (wk)	33.48±2.8		33.85±3.04		5.20	0.0927
BMI (kg/m^2)	31.04±5.57		24.65±4.10		3.18	0.001
Blood pressure	153.87±10.30		120.69±8.96		4.33	0.001



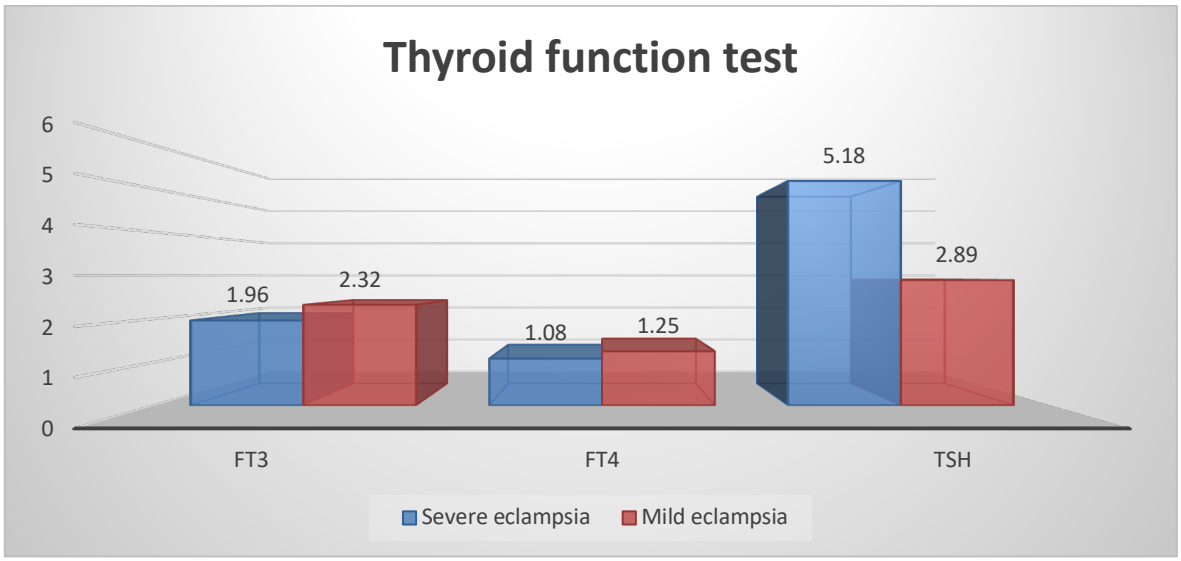
Graph 1: Prevalence of hypothyroidism in women with preeclampsia

Table 2: Comparison of antihypertensive therapy among study participants

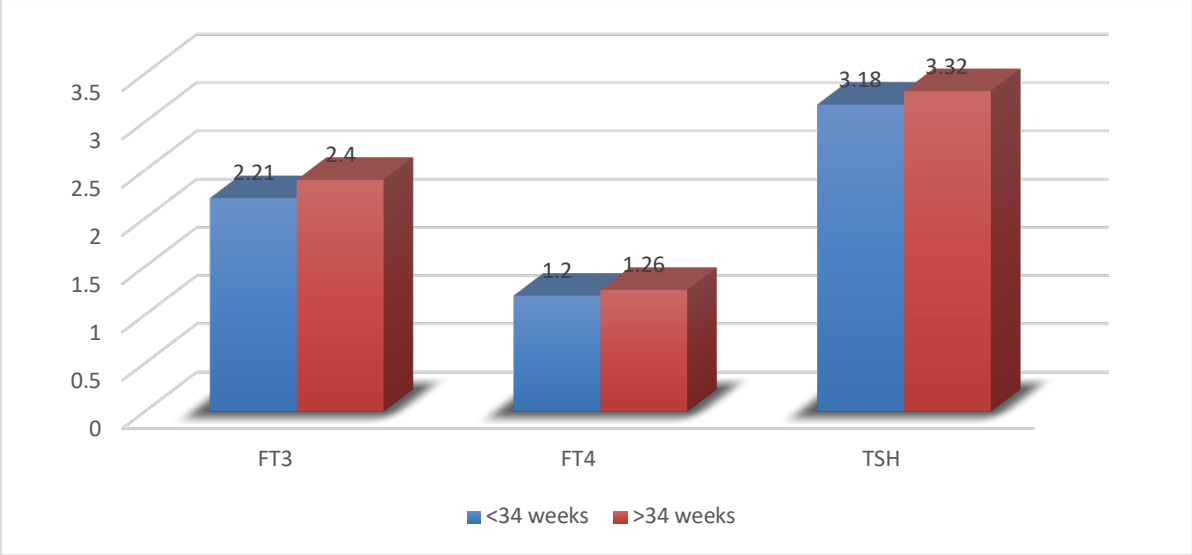
No of drugs	Cases			Controls		
	Before delivery	At discharge	After delivery	Before delivery	At discharge	After delivery
None	-	-	79 (84.04%)	-	-	86 (91.48%)
One	-	84 (89.36%)	12 (12.74%)	49 (52.12%)	91 (96.80%)	07 (7.44%)
Two	18 (19.14%)	07 (7.44%)	02 (2.28%)	35 (37.23%)	03 (3.19%)	01 (1.06%)
Three	58 (61.70%)	03 (3.19%)	01 (1.06%)	10 (10.64%)	-	-
Four	10 (10.64%)	-	-	-	-	-
Five	08 (8.51%)	-	-	-	-	-

Table 3: Levels of thyroid function test in cases and control subjects.

Parameter	Cases	Controls	P-value
	Mean±SD	Mean±SD	
FT3	**2.18**±0.59	**2.40**±0.46	**0.0108**
FT4	**1.21**±0.31	**1.33**±0.27	**0.001**
TSH	**3.24**±1.04	**2.35**±0.94	**0.001**



Graph 2: Comparison of thyroid function test between mild and severe preeclampsia subjects



Graph 3: Association between onset duration of preeclampsia and thyroid function test in study participants

Discussion

Majority participants were between age group 26-30 years (52.12% & 47.88%) followed by 31-35 years (28.72% each) in both groups respectively. In cases, 42.55% had BMI between 26-30 and 38.30% had >30 kg/m^2. Whereas in control subjects, 62.77% had BMI between 18-25 and 47.88% had between 26- 30 kg/m^2. Majority patients were residing in rural area in both groups. Majority participants were graduates (38.29% & 32.98%), followed by intermediate education (30.85% & 31.92%). 63.83%, 21.28% of cases and 59.58%, 19.15% of control subjects were housewives and skilled employees respectively. A study by Harshvardhan L et al., included 100 women (50 preeclampsia and 50 controls) with a mean age of 25.60 years and 24.40 years respectively [12]. Muraleedharan et al., included 80 women (40 case/40 control) with a mean age of 24.98 and 24.55 years [13]. Patil et al., included 80 women (40 case/40 control) with a mean age of 23.25 and 23.73 years [14]. Kumar et al., included 200 women (100 case/100 control) with a mean age of 22.02 and 22.11 years [15]. Mishra et al., included 170 women (80 case/90 control) with a mean age of 24.33 and 23.00 years [16]. Abdal latief et al., included 60 women (30 case/30 control) with a mean age of 23.69 and 25.30 years [17]. Prashanthi et al., included 150 women (100 case/50 control) with a mean age of 25.78 and 25.10 years [18]. Murmu et al. included 150 women (50 case/100 control) with a mean age of 32.95 and 33.98 years in cases and control subjects respectively [19].

The onset of preeclampsia was <34 weeks in 25.54% and >34 weeks in 74.46% of cases. Severe grade preeclampsia was observed in 62.77% and mild grade eclampsia was seen in 37.23% of cases. The mean gestational age was 33.48 weeks and 33.85 weeks, mean BMI was 31.04 kg/m^2 and 24.65 kg/m^2, mean BP was 153.87 mm of Hg and 120.69 mm of Hg in cases and control subjects respectively. Muraleedharan et al., found a mean gestation age 34.50 weeks and 34.50 weeks (13), Patil et al., found 34.33 /36.15 [14], Kumar et al., found 34.54 /36.13 (15), Mishra et al., found 36.7 /37.6 (16), Abdal latief et al., found 34.14 weeks/34.07 weeks [17], Prashanthi et al., found 30.35 /33.98 [18]. Murmu et al., [19] found 32.95 weeks and 33.98 weeks of in cases and controls respectively. The mean gestational age of cases and controls was comparable with the finding present study with previous studies.

The prevalence of hypothyroidism was 40.43% in women with preeclampsia. Before delivery, majority cases were medicated with three (61.70%) antihypertensive drugs followed by 2 drugs (19.14), 4 drugs (10.64%) and 5 drugs (8.51%). At the time of delivery, 89.36% cases had one drug, 7.44% had two drugs, 3.19% had three drugs. After delivery, 12.74% has one drug and 2.28% had two drugs, 1.06% had three drugs and 84.04% cases had no antihypertensive medication (Table 2).

The mean levels of FT3 were 2.18 pg/ml and 2.40 pg/ml, mean FT4 was 1.21 ng/dl and 1.33 ng/dl and mean TSH was 3.21 µIU/ml and 2.35 µIU/ml in cases and control subjects respectively. The mean difference of FT3, FT4 and TSH between study groups was statistically significant ($p<0.05$) (Table 3). A study by Harshvardhan L et al., found mean FT3 was 2.24 pg/ml and 1.99 pg/ml, mean FT4 was 1.13 ng/dl and 1.0 ng/dl and mean TSH was 5.3621 µIU/ml and 3.4821 µIU/ml in preeclamptic cases and control subjects respectively [12]. Muraleedharan et al., [13] found a mean levels of FSH, FT3, and FT4 was 3.76/2.30, 2.12/2.43 and 1.16/1.33, Patil et al., found 3.99/2.32, 3.06/3.41

and 2.26/2.23 [14], Mishra et al., found 5.07/3.30, 2.67/2.56 and 1.15/1.00 [16], Abdal latief et al., found 5.18/1.96, 4.07/3.53 and 0.99/1.12 [17], Murmu et al., [19] found 2.41/1.50, 1.42/1.60 and 0.933/1.08 in cases and controls respectively. Several studies have been reported that the mean levels of TSH were comparatively high in women with preeclampsia than control subjects [20-28].

Depending on severity of preeclampsia, the mean levels of FT3 were 1.96 pg/ml and 2.32 pg/ml, mean FT4 was 1.08 ng/dl and 1.25 ng/dl and mean TSH was 5.18 µIU/ml and 2.89 µIU/ml in severe and mild preeclampsia respectively (Graph 2). According to the onset of preeclampsia, the mean levels of FT3 were 2.21 pg/ml and 2.40 pg/ml, mean FT4 was 1.20 ng/dl and 1.26 ng/dl and mean TSH was 3.18 µIU/ml and 3.32 µIU/ml in cases with onset of preeclampsia in <34 weeks and >34 weeks respectively (Graph 2).

Harshvardhan L et al., found a significantly higher levels of TSH levels in majority of preeclamptic cases and thyroid disease is the predisposing factor for disease development of preeclampsia [12]. A meta-analysis reported that preeclamptic women were more at risk of changes in thyroid function tests. Therefore, thyroid function tests should be considered in preeclamptic women. Identification of changes in thyroid hormones in preeclampsia might be of help in preventing the thyroid disorders [29]. Tabassum Ali et al., reported that pregnant women in third trimester had a 3.7% of chance to develop subclinical hypothyroidism [30]. A study by Aino Lintula et al reported that women with higher levels of TSH may develop hypothyroidism and preeclampsia [31]. Similarly, the outcome of present study showed higher levels of TSH in preeclamptic women than control subjects. The present study has limitations in terms of low participants with single centric approach. Further multicentric studies are required with large sample to evaluate the association of hypothyroidism with pregnant women with preeclampsia at different gestational age.

Conclusion

According to the study's findings, hypothyroidism is more common in preeclamptic women than in healthy women. Hypothyroidism was substantially correlated with the severity of preeclampsia. Women with conditions including obesity, diabetes, hypertension, and TSH should keep track of their levels regularly to prevent hypothyroidism, which can cause preeclampsia and have an effect on both the mother and the foetal outcome.

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