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Assessment of Thyroid Dysfunction During Different Trimester of Pregnancy

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ABSTRACT

Background: Thyroid dysfunction is frequently seen in pregnant women and is associated with complications like miscarriage, gestational hypertension, placental abruption, pre mature delivery and fetal growth retardation and even causes impaired neuropsychological development of fetus. This study is carried out to assess the prevalence of thyroid disorder during different trimester of pregnancy.

Methods: Serum samples were collected from 124 pregnant women attending Patan Academy of Health Science for ante natal visit. Free thyroxine free triiodothyronine and thyroid stimulating hormone were performed by chemiluminescent assay.

Results: Out of 124 pregnant women, euthyroidism was seen in 79% (n =98) followed by subclinical hypothyroidism (10%, n=13) and primary hypothyroidism (8%, n=10). Subclinical hyperthyroidism and primary hyperthyroidism accounts for 1% (n=1), and 2% (n=2) respectively. Although, thyroid disorder was found to be more prevalent in third trimester (38.4%, n=10) but the distribution in first and second trimester (34.6%, n= 9, 27%, n= 7 respectively) were also significant. Mean fT3 and fT4 level were found to be negatively correlated with trimester (r=-0.19, p=0.027 and r=-0.29, p=0.001 respectively) whereas positive correlation of trimester was seen with TSH (r=0.08, p=0.35).

Conclusions: Hypothyroidism is more common in pregnant women visiting tertiary care hospital. Different complication can be minimized if diagnosis is done early.

Keywords: Hypothyroidism; pregnant; thyroid stimulating hormone; trimester, gestational week

INTRODUCTION

Maternal thyroid hormonal level plays a vital role for the fetus during early stage of pregnancy.[1] Most of the studies suggested that maternal thyroid status contribute directly to serious complication related to both maternal and neonatal health resulting spontaneous miscarriage, gestational hypertension, cognitive retardation and impaired neuropsychomotor development in fetus.[2-6] However, it is crucial to diagnose correctly and timely intervention can avoid detrimental effects of thyroid dysfunction on both mother and fetus.[7,8] Moreover, marginal decrease in level of TSH is found during the first trimester of pregnancy while the level seems to be normal during other stages of pregnancy.[9,10] However, free T4 level rises transiently in response to the peak of production of human chorionic Gonadotropin (hCG).[11] We aimed to identify proportion of thyroid dysfunction during pregnancy. In addition, we aimed to assess mean correlation of thyroid hormone level during different trimester.

METHODS

A descriptive cross-sectional study was conducted for six months from to March 2017 to August 2017 in Department of Biochemistry in collaboration with the department of internal medicine in Patan Academy of Health Science, Nepal. 124 pregnant women visiting ANC clinic were enrolled. The consent was taken from each subject verbally. The ethical approval was obtained from Nepal Health Research Council (NHRC), Ramshahpath, Nepal. Female with thyroid dysfunction prior to pregnancy and patients undergoing treatment or taking medication like either amiodarone, lithium, levothyroxine for hypothyroidism and methimazole and propylthiouracil for hyperthyroidism were excluded from the study. Thyroid Function test (FT3, FT4 and TSH) were

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performed by chemiluminescent immunoassay (VITROS ECi Immunodiagnostic Systems). Thyroid dysfunction was stratified trimester-wise based on American Thyroid Association (ATA). [12] Euthyroidism is explained as TSH within the normal range. Subclinical hypothyroidism as TSH > 4.0 mIU/L but thyroid hormones levels within range in first trimester whereas in other trimesters TSH> 4.60 mIU/L is considered. Primary hypothyroidism is defined as TSH > 4.0 mIU/L with fT4 < 1.08 ng/dl in case of first trimester followed by fT4<0.8 ng/dl in other trimesters. Primary hyperthyroidism is considered as TSH < 0.1mIU/L with fT4>1.82 ng/dl in first followed by fT4>1.53 ng/dl in second and fT4>2.19 ng/dl in next.

Sample size was determined by using Slovin's Formula. Analysis of generated data was done by IBM SPSS Windows version 22. The data was further presented as mean and SD values. One way Analysis of Variance (ANOVA) was applied to compare hormonal alteration in different trimester. Pearson's correlation coefficient was used to correlate association between fT3, fT4 and TSH with trimesters. A P value < 0.05 was considered statistically significant.

RESULTS

The study included 124 pregnant women. The mean age group taken was 28.56± 3.87 years. Eighty percentage were euthyroid (n=100) followed by subclinical hypothyroidism (9%, n= 11), primary hyperthyroidism (2%, n=2) and subclinical hyperthyroidism (1%, n=1) irrespective of different trimester or gestational weeks.

Table 1. Distribution of thyroid disorder in pregnant women.

Thyroid dysfunction	Frequency (N)	Percentage (%)
Euthyroidism	98	79
Subclinical hypothyroidism	13	10
Primary Hypothyroidism	10	8
Subclinical Hyperthyroidism	1	1
Primary Hyperthyroidism	2	2
Total	124	100

Table 2. Trimester-wise distribution of thyroid disorder.

Thyroid dysfunction	First Trimester	Second Trimester	Third Trimester	Total
Euthyroidism	33 (78.5%)	34 (83%)	31 (75.6%)	98
Subclinical Hypothyroidism	6 (14.3%)	2 (5%)	5 (12%)	13
Primary Hypothyroidism	2 (4.8%)	5 (12%)	3 (7.4%)	10
Subclinical hyperthyroidism	0 (0%)	0 (0%)	1 (2.5%)	1
Primary Hyperthyroidism	1 (2.4%)	0 (0%)	1 (2.5%)	2
Total	42 (100%)	41 (100%)	41 (100%)	124

Distribution of thyroid disorder in different trimester is described in table 2. Euthyroidism was found to be predominant in all trimester. A single case of subclinical hyperthyroidism was found in third trimester while each single case of primary hyperthyroidism was seen in first and third trimester. Higher frequency of primary hypothyroidism was observed in second trimester (n=5) followed by third (n=3) and first trimester (n=2) while in case of subclinical hypothyroidism, more cases (n=6) was observed in first trimester followed by third and second trimester (n=5, n=2 respectively). In overall, thyroid disorder is more prevalent in third trimester as compared to other two trimesters.

Table 3. Mean fT3, fT4, TSH level on the basis of different trimester.

Variables	First trimester	Second trimester	Third trimester	P value
fT3	3.39±0.96	3.02±0.53	2.99±0.89	0.049
fT4	1.29±0.40	1.01±0.36	0.96±0.53	0.002
TSH	2.75±1.85	3.31±3.07	3.22±2.32	0.502

Mean serum TSH levels were found to be increased with increasing trimester whereas mean serum fT3 and fT4 were higher in first trimester (3.39±0.96 and 1.29±0.40) as compared to second and third trimester (, p= 0.049, p= 0.002 respectively). (Table 3).

Table 4. Mean fT3, fT4, TSH level on the basis of gestational week.

Gestational week	0-7	8-15	16-23	24-31	32+ above	P value[a]
fT3[b]	3.66 ±1.08	3.2 ±0.79	3.15 ±0.50	2.71 ±0.24	3.01 ±0.91	0.037
fT4[b]	1.41 ±0.51	1.17 ±0.36	1.0 ±0.38	0.85 ±0.17	0.98 ±0.55	0.005
TSH[b]	2.35 ±1.39	2.87 ±2.05	4.29 ±4.52	2.82 ±2.22	3.33 ±2.38	0.288

[a]Analysis of variance (ANOVA), [b]Mean ± SD

When we compared fT3, fT4 and TSH level in different gestational weeks irrespective of trimesters, we found that mean fT3 level tends to decrease with increasing gestational week, reach at lower value in 24-31 (3.42±0.53) gestational weeks and the level rise slightly

with increasing gestational week. Mean fT4 level also also follow pattern similar to that of fT3 level while mean TSH level shows an increase and reaches peak value in 16-23 (4.29±4.52) gestational week. (Table 4).

Table 5. Correlation of trimester with fT3, fT4 and TSH level.

Variable	r[c]	P
fT3	-0.19	0.027
fT4	-0.29	0.001
TSH	0.08	0.35

[c]*Pearson correlation*

There was negative correlation between trimester, fT3 and fT4 level (r=-0.19, p=0.027 and r=-0.29, p=0.001 respectively) whereas positive correlation of trimester was seen with TSH (r=0.08, p=0.35) (Table 5).

DISCUSSION

In this study, out of 124 patients, we found that 18% of the pregnant women have hypothyroidism in which subclinical hypothyroidism (SCH) accounts for 10% followed by primary hypothyroidism (8%). However, in study of Upadhaya et al. [13] carried out in western Nepal, the percentage was seen to be higher with SCH and overt hypothyroidism, 31% and 13% respectively. Such variation may occur due to the site we had chosen since our study was conducted in capital city where people are conscious about quality diet and health. According to a study in North India by Dhanwal et al. the prevalence of hypothyroidism is 14.3%, majority being subclinical in pregnant women during first trimester.[14] Similar pattern was also seen in our study as 8% pregnant women were found to have hypothyroidism in first trimester. Although, the incidence was found to be higher as compared to the study of Nagpur, India by Saharabuddhe et al.[15] 2.41% pregnant women were found having hyperthyroidism which is far more than in the study of Mestman J et al. that only accounts for 0.2%. [16] On trimester-wise distribution, incidence of hypothyroidism was 7% in second trimester that is almost similar to that of Sahu et al. with 6.47% in indian population.[17] As we compared thyroid hormones level among different trimester, TSH level had found to be increased with increasing trimester whereas mean fT3 and fT4 were decreased significantly (p = 0.049, p= 0.002 respectively). Similar results were observed in Chinese women in the study of Liang -Miao et al. in which TSH concentration was significantly lower in the first trimester than in third trimester (p=0.001) and the fT4 concentration was higher in the first trimester than in the second and third trimesters (p=0.001).[18] In contrast, reverse pattern was seen in some other studies done in USA.[19]

Likewise mean serum fT3 and fT4 levels were decreased considerably reached lowest value (2.71±0.24, 0.85±0.17 respectively) at 24-31 weeks of gestation and started rising as increase in trimester. This is not quite surprising at all because in the first trimester fetus is dependent on mother's thyroid hormone [1] whereas in case of TSH, the value increases and reach peak value at 16-23 weeks .[20] In agreement with the study of Ashoor et al. [21] in Maine, USA, mean serum TSH was found to be positively correlated with increasing trimester. (r= 0.08 p=0.35) whereas mean fT3 and fT4 were found to be negatively correlated (r= -0.19, -0.29) p= (0.027, 0.001) respectively.

This study has potential limitations. Our results may be influenced as:

Small sample size and single center study limits the generalization of the result

Trimester specific reference range for Nepalese population was not used.

Thyroid dysfunction was classified on the basis of Thyroid hormones level only.

There is lack of information on clinical characteristics

Supporting tests such as thyroid-stimulating hormone (TSH) and anti-thyroid peroxidase antibodies (TPO), and thyroid scan were not performed.

The pregnancy outcome of such thyroid dysfunction was not assessed

However, a large-scale study is needed to determine trimester specific reference range and effect of thyroid dysfunction on pregnancy outcome.

CONCLUSIONS

This study shows that thyroid disorder particularly hypothyroidism is more prevalent during pregnancy. Although, higher incidence of thyroid disorder was found in third trimester as compared to first and second trimester, screening for thyroid function should be suggested during various trimester of pregnancy for early recognition of thyroid dysfunction resulting timely treatment followed by safe delivery and healthy future generation.

CONFLICT OF INTEREST

The authors declare no conflict of interest

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