INTERNATIONAL JOURNAL OF ADVANCES IN PHARMACY, BIOLOGY AND CHEMISTRY

Research Article

Thyroid function in women with mid and late pregnancy

Nasreen Khalil Abdelhafiz[1],Elsadig Mohamed Ahmed[2, 4] and Eltayeb Tayrab[3, 4].

[1]Department of clinical chemistry, Faculty of Medical Laboratory Sciences, Alneelain University, Khartoum-Sudan.

[2]Department of chemical pathology, Faculty of Medical Laboratory Sciences, ElimamElmahdi University-Sudan.

[3]Department of chemical pathology, Faculty of Medical Laboratory Sciences, National Ribat University, Khartoum-Sudan.

[4]Department of medical laboratories; Faculty of Applied Medical Sciences, BishaUniversity, Bisha, Kingdom of Saudi Arabia.

ABSTRACT

Background and objectives: The objective of this study was to assess the necessity of regular monitoring of thyroid function status during mid and late stages of pregnancy.

Patients and method: Maternal thyroid function was investigated in 50 normal pregnant women in their second and third trimester and 50 age-matched non-pregnant women, attending the antenatal clinics in the Ribat University Hospital and Reproductive Health Care Center, Khartoum, Sudan.

Results: The mean age in the pregnant women was (29.000±3.989 years) and in controls was (28.000± 3.664 years). The mean FT3 in cases was (2.418±1.654pg/ml) and in controls was (2.375±0.326pg/ml), the mean FT4 in the pregnant women was (1.132±0.489ng/dl), and (1.115±0.183ng/dl) in the control group. The mean TSH in the pregnant women was (2.470±2.481 µIU/ml), while in the non-pregnant women was (1.473±0.616 µIU/ml). The progress of pregnancy from second to third trimester was positively correlated with FT3 levels (p value=0.000). The age of the pregnant women was significantly positively correlated with TSH levels with (p value= 0.017). Using ANOVA analysis there was significant difference observed in TSH levels(p value = 0.001) in the women in second trimester and the control group, but no significance difference seen in FT3 & FT4 levels in the same subgroup.

Conclusion: In Sudanese women in the second and third trimester of normal pregnancy, the FT4 and FT3 levels remain normal; while TSH levels significantly elevate (p value = 0.017). There is no influence of parity and maternal age on thyroid functions. Thyroid function should be routinely investigated in the mid and late pregnancy.

Key words: free tri-iodothyronine, free tetra-iodothyroxine, follicle stimulating hormone, second and third trimester women, Sudan.

INTRODUCTION

Thyroid dysfunction is the second most common endocrine disorder, only after diabetes mellitus, affecting females in reproductive age group[1]. The thyroid hormones play an important role in early neurodevelopment of the newborn [2]. In the human fetus, the synthesis of tetra-iodothyronine (T_4 or thyroxine) and tri-iodothyronine (T_3) starts from 17 to 19th weeks of gestation, in the second trimester

[3].During pregnancy, there is an increased thyroid demand and increased iodine uptake and synthesis of thyroid hormones [4]. Low maternal circulating thyroxine levels have been associated with a significant decrement in child IQ and development [5, 6]; so adequate fetal thyroid hormone levels are required in order to ensure normal central and peripheral nervous system maturation[5]. In pregnant women; estrogen induces a rise in serum thyroid binding globulin, while the placenta releases several thyroid stimulatory factors in excess like human chorionic gonadotropin (hCG) [4]. During the 1st trimester (hCG) induces a transient increase in (FT4) levels, which is mirrored by a lowering (TSH) concentrations. Following this period, or 2nd trimester, serum FT4 concentrations decrease of approximately 10 to 15%, and serum TSH values steadily return to normal [7], while others said; serum FT3 and FT4 levels decrease gradually from the first to the last three months of pregnancy, and TSH level increases gradually during the whole pregnancy [8,9].
Thyroid disorders play a role in recurrent pregnancy loss[10].
Maternal thyroid dysfunction during pregnancy may permanently affect childhood growth and cardiovascular development [11].Thyroid hormonal levels correlated with the severity and outcome of preeclampsia [4]. Hence; it is necessary for the obstetricians to monitor thyroid function status regularly during pregnancy [12].

MATERIALS AND METHODS

In this case control study; fifty Sudanese normal pregnant women in their second or third trimester of pregnancy were recruited from antenatal clinics in the Ribat University Hospital and Reproductive Health Care Center, Khartoum, Sudan, in the period from April to August 2014. Another 50 ages matched healthy non-pregnant Sudanese women were served as controls. The information regarding age, educational level, socioeconomic status, dietary habits and thyroid disorders were collected through self-structured questionnaire and health care accompanied files. The pregnant women were normotensive with normal pregnancy. This group of subjects were sub-grouped into 30 ladies in their second trimester (14-27 complete weeks), and other 20 women in their third trimester (28 complete weeks until delivery). Ethical clearance was taken from the authorities, while written consent was taken from all subjects. Five ml blood was collected in a plain container from each subject. Serum was separated after centrifugation at 3,000 RPM for 10 minutes, and then stored at -70 ^{O}C, till the time of biochemical analysis. Serum FT3, FT4 and TSH were measured using automated chemical analyzer (TOSOH AIA - 360).Control samples used, were from Biosystem Company (Spain). Statistical analysis was conducted using IBM SPSS Statistics 20 and one way ANOVA ($p<0.05$). Simple descriptive statistics (mean and standard deviation), were used to describe the observed variation in thyroid profile between the groups under the study.

RESULTS

This study revealed that; the mean age in the pregnant women was (29.000±3.989 years) and in controls was (28.000± 3.664 years), the mean FT3 in cases was (2.418±1.654pg/ml) and in healthy controls was (2.375±0.326pg/ml), the mean FT4 in the pregnant women was (1.132±0.489ng/dl), and (1.115±0.183ng/dl) in the non-pregnant control group. The mean TSH in the pregnant women was (2.470±2.481 µIU/ml), while in the non-pregnant women was (1.473±0.616 µIU/ml) Table (1).Total numbers of primigravidas were 23 (46%), while multigravidas were 27 (54%) Table (2 & 3). Thirty (60%) of pregnant women were in their second trimester, while 20 (40%) were in their third trimester.
The progress of pregnancy from second to third trimester was positively correlated with FT3 levels (p value=0.000), while negatively correlated with TSH and FT4 (p value= 0.888 and 0.489 respectively.
The age of the pregnant ladies was significantly positively correlated with TSH levels with (p value= 0.017).
The levels of FT3, FT4 and TSH were not significantly changed between multigravidas and primigravidas Table (3). Using ANOVA analysis there was significance difference observed in TSH levels ($p = 0.001$) in the women in second trimester and the control group, but no significance difference seen in FT3 and FT4 levels in the same subgroup Table (4 & 5).

DISCUSSION

As serum TSH concentration is initial thyroid function test; in this study a significantly raised TSH, is observed in the women with mid and late pregnancy, this finding is consistent with that reported by Divya et al (2009)[4] from India, Zha et al (2014)[8] from China and Bliddal et al (2013)[9]. No significant reduction in the levels of (FT3&FT4) was found in this study; when the pregnancy progressed from the second to the third trimester; which is consistent with that concluded by Osathanondh et al (1976)[13], while in disagreement with that concluded by Zha et al (2014)[8] Table (1). The clinical impact of elevated TSH and reduced FT3 & FT4 form the triangle of biochemical hypothyroidism in normal pregnancy. Hypothyroidism in pregnancy is

commonly associated with preeclampsia as reported by Osathanondh et al (1976)[13] and Khaliq and colleagues (1999)[14], considering that; pregnancy induced hyperplasia is race dependent and more common in Non-Hispanic Black women (and Sudan belongs to this race), as reported by Ghosh et al (2014)[15].

This study showed no influence of parity on thyroid functions, this is also written by Khaliq and colleagues (1999) [14] Table (2 & 3). While the age of the pregnant lady is significantly positively correlated with TSH levels with (p value= 0.017); which is consistent with that reported by Bliddal et al (2013) [9]. In this study the levels of TSH, FT3 and FT4 were not significantly influenced by the gravidity (multigravidas and primigravidas), that is consistent with that reported in Israel by Taiba et al (2014)[16].

CONCLUSION

It is more convenient to measure routinely; FT3, FT4 beside TSH rather than total T3 and total T4; for monitor maternal thyroid status during pregnancy for the sake of secure fetal development. Large study composed of normal pregnant women and others with pregnancy induced hyperplasia is recommended.

ACKNOWLEDGMENTS

The authors would like to thank the staff of Ribat University Hospital and Reproductive Health Care Center, Khartoum-Sudan fortheir great support.

No financial support was received from any agent or company.

Table 1

Comparative study of the age, free triiodothyronine (FT3), free thyroxin (FT4) and TSH in the 2nd and 3rd trimesters of pregnant women and their controls.

Items	2nd& 3rd trimester pregnant women (n=50) (mean ± std)	Non-pregnant control women (n=50) (mean±std)	P value
Age (yr)	29.000±3.989	28.000± 3.664	
FT3(pg/ml)	2.418±1.654	2.375±0.326	0.860
FT4(ng/dl)	1.132±0.489	1.115±0.183	0.815
TSH (µIU/ml)	2.470±2.481	1.473±0.616	0.007

Table 2

Descriptive table of the number of pregnancies among the study group

Item	No of pregnancies	Percent (%)
Primigravidas	23	46%
Para two	17	34%
Para three	7	14%
Para four	2	4%
Para five	1	2%
Total	50	100

Table 3

Comparative study of FT3, FT4 and TSH between primigravadas and multigravidas of the study group.

parameters	**Primigravidas** (n=23) (mean±std)	**Multigravidas** (n=27) (mean±std)	P value
FT3(pg/ml)	2.181±0.584	2.619±0.420	0.325
FT4(ng/dl)	1.081±0.322	1.176±0.598	0.500
TSH (µIU/ml)	2.800±0.642	2.188±0.354	0.409

Table 4
ANOVA test for comparison of serum TSH levels among study groups

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	37.041	2	18.521	5.831	0.004
Within Groups	308.071	97	3.176		
Total	345.113	99			

Table 5
Post Hoc multiple comparisons of TSH in the second and third trimester in the study group

(I) Trimester	(J) Trimester	Mean Difference (I-J)	Std. Error	Sig.
Second trimester	Third trimester	1.009	0.514	0.053
	Control	1.400*	0.411	0.001
Third trimester	Second trimester	-1.009	0.514	0.053
	Control	0.390	0.471	0.409
Control	Second trimester	-1.400*	0.411	0.001
	Third trimester	-.390	0.471	0.409

REFERENCES

1. Vandana KA, Khatuja R, Mehta S. Thyroid dysfunction during pregnancy and in postpartum period: treatment and latest recommendations.Arch Gynecol Obstet. 2014; 289 (5):1137-44.
2. Li C, Cheng Y, Tang Q, Lin S, Li Y, Hu X, Nian J, Gu H, Lu Y, Tang H, Dai S, Zhang H, Jin C, Zhang H, Jin Y, Jin Y. The association between prenatal exposure to organochlorine pesticides and thyroid hormone levels in newborns in Yancheng, China.Environ Res. 2014; 129:47-51.
3. Pérez-LópezFR.. Iodine and thyroid hormones during pregnancy and postpartum. Gynecol. Endocrino. 2007; 23(7): 414–28.
4. DivyaS, Smiti N, Simmi K. Thyroid hormones in pregnancy and preeclampsia. J Turk GerGynecol Assoc. 2009; 10(3): 168–71.
5. Lazarus JH. Thyroid disorders associated with pregnancy: etiology, diagnosis, and management.Treat Endocrinol. 2005; 4 (1):31-41.
6. Lewis EB, David SC. Werner &Ingbar's The Thyroid: A Fundamental and Clinical Tex. 10th ed. Philadelphia:Lippincott William's & Wilkins; 2012; 827-31.
7. Moleti M, Trimarchi F, Vermiglio F. Thyroid physiology in pregnancy. EndocrPract. 2014; 20 (6):589-96.
8. Zha J, Ming D, Jiang Y, Huang C, Jiang T, Chen C, Lin R, Su W, Gu S. Establishment of reference range for thyroid hormones in normal pregnant women in China's coastal area.ClinExpObstet Gynecol. 2014; 41(2):135-40.
9. Bliddal S, Feldt-Rasmussen U, Boas M, Faber J, Juul A, Larsen T, Precht DH. Gestational age-specific reference ranges from different laboratories misclassify pregnant women's thyroid status: comparison of two longitudinal prospective cohort studies.Eur J Endocrinol. 2013; 170 (2):329-39.
10. Pluchino N, Drakopoulos P, Wenger JM, Petignat P, Streuli I, Genazzani AR. Hormonal causes of recurrent pregnancy loss (RPL).Hormones (Athens). 2014; 13 (3):314-322.
11. Godoy GA, Korevaar TI, Peeters RP, Hofman A, de Rijke YB, Bongers-Schokking JJ, Tiemeier H, Jaddoe VW, Gaillard R. Maternal thyroid hormones during pregnancy, childhood adiposity and cardiovascular risk factors: the Generation R Study.ClinEndocrinol (Oxf). 2014; 81(1):117-25.
12. Cai J, Zhao X, Lei T, Meng Q, Zhou H, Zhang M. Urinary thyroid hormone parameters test for evaluating the thyroid function during pregnancy.SystBiolReprod Med. 2014; 60 (3):171-6.
13. Osathanondh R, Tulchinsky D, Chopra IJ. Total and free thyroxine and triiodothyronine in normal and complicated pregnancy. J ClinEndocrinolMetab. 1976; 42: 98-104.

14. Khaliq F, Singhal U, Arshad Z, Hossain MM. Thyroid functions in preeclampsia and its correlation with maternal age, parity, severity of blood pressure and serum albumin. Indian J physiolPharmacol. 1999; 43: 193-8.
15. Ghosh G, Grewal J, Männistö T, Mendola P, Chen Z, Xie Y, Laughon SK. Racial/ethnic differences in pregnancy-related hypertensive disease in nulliparous women. Ethn Dis, 2014; 24(3):283-9
16. TaibaZ,Miron F, Rubi A and Samuel L. Point Prevalence of abnormal thyroid-stimulating hormone during the first trimester of pregnancy in Israel.IMAJ. 2014; 9: 564-7