RESEARCH ARTICLE

ASSESSMENT OF SERUM LIPID PROFILE AND THYROID HORMONE DURING DIFFERENT TRIMESTERS OF PREGNANCY

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ABSTRACT

Background: pregnancy is associated with maternal physiological, biochemical and hormonal changes. The aim of this study was to assess the serum lipid profile and thyroid hormones among Sudanese pregnant women. **Materials and Methods:** This cross-sectional case control study conducted at Hafiz Almisbah private medical center, Khartoum Sudan in the period from April to September 2018. Sixty pregnant women; as cases; (20 from each trimester) and sixty non-pregnant women; as controls; were included in the study. A fasting venous blood was collected from each participant, obtaining the serum; thyroid hormones were measured by ELISA (Stat fax - 2100) , and total cholesterol, triglycerides, LDLc and HDLc were measured by CHEM-7, Erba Mannheim. Data were analyzed using the SPSS version 20, t-test was used for comparison of means between two groups and Pearson's correlation test was used to test the association between study parameters and variables, P-value < 0.05 is considered significant. **Results:** There was a significant increase in total cholesterol (mean ± SD: case; 197.03 ± 40.39 versus control; 171.05 ± 40.23 mg/dl, p-value: 0.001), triglyceride (mean ± SD: case; 172.45 ± 42.15 versus control; 149.05 ± 42.06 mg/dl, p-value: 0.044), HDLc (mean ± SD: case; 46.58 ± 10.32 versus control; 41.80 ± 7.82 mg/dl, p-value 0.005) and LDLc (mean ± SD: case; 116.50 ± 38.94 versus control; 99.02 ± 36.25 mg/dl, p-value: 0.012), T3 (mean ± SD: case; 1.54 ± 0.39 versus controls; 1.29 ± 0.37 Iu/l, p- value: 0.001) and T4 (mean ± SD: case; 8.92 ± 1.81 versus controls; 8.25 ± 1.10 Iu/l , p-value: 0.016), while there was a significant decrease in TSH (mean ± SD: case; 0.47 ± 0.42 and control; 2.35 ± 1.23 Iu/l, p-value: 0.000), The result also showed a significant positive correlation between total cholesterol and T3(r: 0.437, p-value: 0.000), cholesterol and T4 (r: 0.539, p-value: 0.000), cholesterol and TSH (r: 0.313, p- value: 0.015), triglycerides and T3 (r: 0.513, p- value: 0.000), triglycerides and T4 (r: 0.560, p- value: 0.000), triglycerides and TSH (r: 0.270, p-value: 0.037), HDLc and T3 (r: 0.408 p-value: 0.000), HDLc and T4 (r: 0.541, p-value: 0.000), HDLc and TSH (r: 0.279, p-value:0.031), LDLc and T3 (r: 0.328, p-value: 0.011) and LDLc and T4 (r: 0.392, p-value: 0.002); but there was no correlation between LDLc and TSH (r: 0.242, p-value: 0.062. **Conclusion:** pregnant women had increased levels of total cholesterol, triglycerides, HDLc and LDLc, T3 and T4, and they had decreased levels of TSH.

INTRODUCTION

Pregnancy is associated with many metabolic changes in mother with maternal physiological, biochemical and hematological changes drastically during early pregnancy, maternal metabolic environment is modified by arise in serum levels of estrogen and progesterone (Raghuram *et al*., 2016).

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Pancreatic beta- cell hyperplasia occurs and there is an increase in the secretion of insulin, hyperinsulinemia lead to an increase in peripheral glucose utilization; decline in fasting plasma glucose levels increased tissue storage of glycogen, increased storage of fats and decreased lipolysis (Mankuta *et al.*, 2010). Freinkel described the maternal metabolic changes of late pregnancy as "accelerated starvation" when food is unavailable and "facilitated anabolism" when food is ingested. Maternal fuel adjustments during late pregnancy include sparing of glucose for the fetus and an increased concentration of fatty acids in plasma (Freinkel, 1964).

In pregnant women lipid profile changes during pregnancy are result of physiological adaptation to the state of pregnancy, there are increases in the blood concentration of cholesterol, triglycerides, LDL cholesterol, and HDL cholesterol; this increase leeds to the accumulation of lipid in vessel linings condition called atherosclerosis, also myocardial infarction or death can occur (Butte, 2000; Parchwani *et al*., 2011).

MATERIALS AND METHODS

Study design: This was a cross-sectional case control study.

Study area and Period: The Study conducted in Khartoum state, Sudan from period between April to September 2018.

Study Population: A total of 60 Sudanese pregnant women were recruited (from Almosbah Medical Center in Khartoum) as cases (20 pregnant women in the 1st trimester, 20 pregnant women in the 2nd trimester and 20 women in the 3rd trimester of pregnancy) and 60 Sudanese healthy non pregnant women serves as control group were enrolled in this study. Age was matched between the groups (range between 20 to 45 years).

Inclusion criteria: Pregnant women (as cases) and healthy non-pregnant women (as controls) were included in this study.

Exclusion criteria: women with history of hypertension, diabetes mellitus, insulin therapy, hypoglycemic or hypolipidemic drugs intake, smoking, alcoholism, liver, cardiac or renal diseases or any other major illness, women with molar pregnancy, twins or multiple fetuses were excluded from this study.

Ethical Consideration: The study was approved by the Scientific and ethical committee of the Clinical Chemistry Department of Faculty of Medical Laboratories Sciences Al-Neelain University. Then an Informed consent was obtained from participants of the study. Demographic data was collected through questionnaire.

Sampling: About 3ml of fasting venous blood was collected from the antecubital vein under aseptic conditions. The blood was allowed to clot then serum was separated by centrifugation for 10 minutes at 3000 rpm. The estimation of the parameters was carried out within 4-6 hrs.

Methods: Total cholesterol (TC), triglycerides (TG), LDLc and HDLc were measured by using an analytical kit from ERBA Diagnostics Mannheim GmbH in semi-auto analyzer (CHEM-7, ErbaMannheim). TSH, T3 and T4 were analyzed by ELISA.

Quality Control: The internal control sera of two different levels were used to calibrate the instruments and to assure the accuracy of results.

Data Analysis: Data was analyzed by using SPSS computer program, the mean and standard deviation were obtained and the independent t. test was used for comparison of means, and Pearson's correlation test was used to test the correlation between study parameters and age and weight. P-value of ≤ 0.05 was considered significant.

RESULTS

In the current study; the age of participants ranges between 20 to 45 years with weight ranges from 53 to 85 (Table 1). In comparison with the controls, pregnant women had significantly increase in means of serum lipid profile and T3, T4 , while there was a significant decreased in mean of TSH levels (Table 2). In comparison between trimesters of pregnancy and control group; the result showed a significant increased in lipids profile and T4, but no statistical difference in T3 level and there was a significant decreased in TSH level (Table 3). The result showed no correlation between lipid profile, T3, T4 and weight, while there was a negative correlation between TSH and weight (Table 4). No significant difference was found in the comparison of mean concentration of lipid profile and thyroid hormones across the age (Table 5). The result also showed a significant positive correlation between total cholesterol and T3, cholesterol and T4, cholesterol and TSH, triglycerides and T3, triglycerides and T4, triglycerides and TSH, HDLc and T3, HDLc and T4, HDLc and TSH, LDLc and T3 and LDLc and T4; but there was no correlation between LDLc and TSH (Table 6).

DISCUSSION

In the current study which was designed to assess lipid profile (TC, TG, HDLc and LDLc) and TSH ,T3 and T4 in Sudanese pregnant women; the results showed that pregnant women had significantly increase in means serum lipid profile and T3, T4 , while there was significant decreased in mean of TSH levels. This result agreed with another result which finding confirmed that, there were significant increased in lipids profile and T3, T4 in pregnant women (Raghuram *et al*., 2016; Wiznitzer, 2009; Bassi, 2011). As metabolic changes can lead to accumulation of fat; which might occur at different times during pregnancy; maternal metabolic environment is modified by arise in serum levels of estrogen and progesterone (Raghuram *et al.*, 2016), also thyroid hormones causes cholesterol synthesis and degradation as well as increase lipolysis (Mankuta *et al*., 2010).

In comparison between trimesters of pregnancy and control group; the results of the present study showed a significant increased in lipid profile and T4, but no difference in T3 level and there was a significant decreased in TSH level, this results agreed with previous study results; which showed increased levels of cholesterol, TG and LDL-c in pregnant women in different trimesters, while HDLc in third trimester (Lippi *et al*., 2007). The results also are similar to another previous study results which confirmed that during pregnancy both serum levels of T3,T4 were higher than serum TSH level this, may produce hyperthyroidism if not controlled symptoms (Napoli, 2001). The results of the current study revealed a significant positive correlation between total cholesterol and T3, cholesterol and T4, cholesterol and TSH, triglycerides and T3, triglycerides and T4, triglycerides and TSH, HDLc and T3, HDLc and T4, HDLc and TSH, LDLc and T3 and LDLc and T4; but there was no correlation between LDLc and TSH. This agreed with what reported that thyroid function tests change during pregnancy due to the influence human chorionic gonadotropin (Guillaume, 1985), and serum TSH levels declines in pregnant women compared with non pregnant women and the high circulating hCG levels in the first

Table 1. Mean age and weight of the participants

Variables	Minimum	Maximum	Mean ± SD
Age	20.00	45.00	30.68 ± 5.82
Weight	53.00	85.00	70.33 ± 7.20

Table 2. Comparison of means concentration of lipid profile and thyroid hormones among study groups

Parameters	Case (Mean±SD)	Control (Mean±SD)	*P-value*
TC mg/dl	197.03 ± 40.39 (107 – 280)*	171.05 ± 40.23 (98 – 290)*	0.001
TG mg/dl	172.45 ± 42.15 (105 – 308)*	149.05 ± 42.06 (43 – 357)*	0.044
HDLc mg/dl	46.58 ± 10.32 (29 -71)*	41.80 ± 7.82 (32 – 65)*	0.005
LDLc mg/dl	116.50 ± 38.94 (52 – 191)*	99.02 ± 36.25 (61 – 191)*	0.012
T3 Iu/l	1.54 ± 0.39 (0.78 – 1.92)*	1.29 ± 0.37 (0.87 – 1.92)*	0.001
T4 Iu/l	8.92 ± 1.81 (5.16 – 11.1)*	8.25 ± 1.10 (6.24 – 11.00)*	0.016
TSH Iu/l	0.47 ± 0.42 (0.02 – 1.50)*	2.35 ± 1.23 (0.03 – 1.50)*	0.000

P-value ≤ 0.05 consider as significant, * shows the minimum and maximum concentrations.

Table 3. Comparison of means concentration of lipid profile and thyroid hormones across the pregnancy trimester

Parameters	Mean ± SD			
	First trimester	Second trimester	Third trimester	Control
TC mg/dl	157.10 ± 18.40 (107 – 186)*	188.60 ± 16.03 (161 – 217)*	245.40 ± 15.98 (216 – 280)*	171.05 ± 40.23 (98 – 290)*
P-value	0.082	0.030	0.000	
TG mg/dl	130.40 ± 18.11 (105 – 125)*	174.00 ± 8.72 (161 – 191)*	212.95 ± 39.02 (180 – 308)*	149.05 ± 82.06 (43 – 357)*
P-value	0.240	0.117	0.000	
HDLc mg/dl	35.20 ± 3.49 (52 – 71)*	46.20 ± 3.38 (40 – 52)*	58.35 ± 5.02 (29 – 39)*	41.80 ± 7.81 (32 – 65)*
P-value	0.005	0.000	0.000	
LDLc mg/dl	82.55 ± 19.51 (52 – 125)*	119.00 ± 31.45 (74 – 175)*	147.95 ± 32.84 (61 – 191)*	99.02 ± 36.25 (25 – 170)*
P-value	0.005	0.007	0.000	
T3 Iu/l	0.96 ± 0.13 (0.78 – 1.30)*	1.42 ± 0.38 (0.97 – 1.90)*	1.50 ± 0.30 (0.87 – 1.92)*	1.54 ± 0.39 (0.72 – 2.18)*
P-value	0.000	0.666	0.197	
T4 Iu/l	7.12 ± 1.12 (5.16 – 9.15)*	9.83 ± 1.57 (6.24 – 11.1)*	9.83 ± 1.16 (6.24 – 11.00)*	8.25 ± 1.10 (6.70 - 10.50)*
P-value	0.000	0.000	0.000	
TSH Iu/l	0.32 ± 0.41 (0.02 – 1.20)*	0.45 ± 0.37 (0.03 – 1.59)*	0.64 ± 0.42 (0.03 – 1.50)*	2.35 ± 1.22 (0.33 – 4.90)*
P-value	0.000	0.000	0.000	

P-value ≤ 0.05 consider as significant, * shows the minimum and maximum concentrations.

Table 4. Correlation between lipid profile and thyroid hormones with weight of pregnant women

Parameters	*R-value*	*P-value*
TC	-0.042	0.748
TG	-0.059	0.652
HDL	-0.043	0.744
LDL	-0.151	0.249
T3	0.006	0.963
T4	0.010	0.937
TSH	-0.352	0.012*

P-value ≤ 0.05 consider as significant

Table 5. Comparison of mean concentration of lipid profile and thyroid hormones across the age

Parameters	20-30 Years (Mean ± SD)	31-45 Years (Mean ± SD)	*P-value*
TC	194.4 ± 44.1	200.0 ± 36.3	0.594
TG	170.9 ± 48.3	174.2 ± 34.6	0.769
HDL	45.4 ± 10.5	47.9 ± 10.1	0.350
LDL	118.3 ± 39.8	114.5 ± 38.6	0.713
T3	1.24 ± 0.38	1.36 ± 0.36	0.236
T4	8.56±1.80	9.34±1.77	0.100
TSH	0.51 ± 0.44	0.42 ± 0.39	0.410

P-value ≤ 0.05 consider as significant.

Table 6. Correlation between lipid profile and thyroid hormones in pregnant women

Parameters		TC	TG	HDL	LDL
T3	R	0.437	0.513	0.408	0.328
	P	0.000	0.000	0.000	0.011
T4	R	0.539	0.560	0.541	0.392
	P	0.000	0.000	0.000	0.002
TSH	R	0.313	0.270	0.279	0.242
	P	0.015	0.037	0.031	0.062

P-value ≤ 0.05 consider as significant

trimester may result in a slightly low TSH (Burrow *et al.*, 1994). The results also showed no correlation between lipid profile, T3, T4 and weight, while there was a negative correlation between TSH and weight, this agree with another study which finding confirmed that , hyperthyroidism cause weight loss (Burrow *et al.*, 1994). It is widely known that thyroid function undergoes many significant changes during pregnancy (Burrow *et al.*, 1994).

Conclusion

In conclusion; Sudanese pregnant women had increased levels of total cholesterol, triglycerides, HDLc and LDLc, T3 and T4, and they had decreased levels of TSH which is negatively correlated with weight.

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