

Determination TT4 and FT4 Levels and Hematological Parameters among Pregnant Women

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Abstract

The current study was aimed to determine the TT4 and FT4 Levels and some hematological parameters in the pregnant women. The determination of changes in some blood components was archived on 20 pregnant women and 10 non-pregnant women using measurement of the complete blood picture RBC, HGB, HCT in the blood serum. Measuring the level of free T4 and T4 thyroxin hormones in the serum of pregnant and healthy women attend to the Al-Shams Medical Laboratory in Baqubah. The result of this study shows the mean value of RBCs parameter was low in the pregnant (4.28 ± 0.46), whereas the control showed 5.02 ± 0.35 , and no significant different at $P > 0.05$. The mean value of HGB was low in the Pregnant (11.35 ± 1.24), while in the control was 14.10 ± 1.10 with significant different at $P < 0.05$. In addition, the mean value of HCT was low in the pregnant (34.66 ± 9.16) compared with the control (41.78 ± 3.22) with significant different at $P \leq 0.05$. The mean value of TT4 was higher in the pregnant (162.76 ± 31.63) than the control (5.02 ± 0.35) with significant different at $P < 0.05$, and the mean value of FT4 in the pregnant (15.73 ± 2.61) was lower than control (22.11 ± 5.04). The highest sensitivity of TT4 and FT4 were 100% and 50% respectively, RBCs (15%), HGB (12%) and HCT (20%) showed the sensitivity with significant different at $p < 0.05$. Depending on specificity of HgB, RBCs and HCT a highest specificity (90%, 70% and 60%) respectively, while, the specificity of TT4 (50%) and FT4 (40%) showed a significant different at $p < 0.05$. The RBCs parameter was positive correlation with of HGB ($r = 0.472^*$), TT4 ($r = 0.281$), and FT4 ($r = 0.020$). HCT parameter showed the positive correlation with RBCs ($r = 0.438$) and HGB ($r = 0.462^*$) while there is a negative correlation with FT4 ($r = -0.167$) and TT4 ($r = -0.095$), and FT4 and TT4 showed a high significant positive correlation. In conclusion, the red blood cells coefficient, HGB, HCT was lowest in the pregnant women. The mean value of the TT4 coefficient was high in the pregnant women, while the mean value of the FT4 coefficient was low in pregnant women. The highest sensitivity was with TT4 and FT4, while the lowest seen with RBCs HGB and HCT. The specificity of HgB, RBCs and HCT was the highest, while, the lowest was in the TT4 and FT4.

Keywords. Pregnant Women, Anemia. Thyroid Gland.

1. Introduction

Pregnancy is a normal physiological issue that is associated with increase biological process and anabolic metabolism that change in multiple hormones level in mother body, all physiological events that occur during every trimester of pregnancy need a high degree of arrangement and hormonal balance [1]. Pregnancy will cause physiological changes in all mother's body systems but most of it will return to normal after delivery [1]. Physiological changes that occur in body of pregnant women to adapt with fetus and its growth, the changes in the hyperglycemia, increase of cardiac output and increase respiratory rate and changes in quantity and function of some hormones as increase in estrogen and progesterone hormone level [1]. Estrogen hormone is secreted essentially from placenta, it increase continue with pregnancy trimesters and reach its maximum in the last trimester of pregnancy [2]. Progesterone hormone is secreted from yellow body in

first trimester of pregnancy, then excretion from placenta Progesterone hormone causes relaxation of ligaments and joints and increases the size of internal organs like uterus. Progesterone is essential in reproduction also might cause of annoying hyperacidity, vomiting, bowl gases and constipation [3]. Placenta produce a hormone resampling to thyroid stimulating hormone, that stimulate thyroid gland, leading to moderate thyroid enlargement and increase in blood vessels. Also, estrogen will stimulate liver cells causing increase of globulin levels that in relation to thyroid gland, and accordingly to increase thyroid hormone levels, but free thyroid hormones levels are still be within normal effects. Thyrotoxicosis might occur in 0.08% of pregnancies due to physiological changes of functional, physiological and hormonal changes in thyroid gland leading to increase of T3, T4 that production different health complications of thyroid gland disease during pregnancy such as abortion and anemia eclampsia, gestational hypertension, and premature labor [4].

2. Material and Methods

The research sample consisted of 20 pregnant women and 10 non-pregnant women as a control in the age ranging between 24 to 40 years-old at the average 32 years-old those whom attended Al-Shams Medical Laboratories at Baqubah. The venous blood sample of 5 ml was taken from each woman to complete the blood count (CBC) by self-analysis type (Sysmex XN-350) from the Japanese company Symex. Free thyroxin hormone of free T4 and total T4 evaluated using equipped by the German company Roche (Cobas device 411). The data was analyzed using the chi-square test to compare the percentages, and the ROC curve to measure of the sensitivity and specificity of diagnostic tests. The history was described by Mean+SD and T test to compare the two numerical variables. The Pearson R correlation was calculated explaining the type and strength of the relationship between the variables, the significance level at ≤ 0.05 . The application of the test Graphpad prism V. 6 and SPSS V. 22 programs used in the analysis of the current data.

3. Results

Result of current study shows the mean value of RBCs parameter was low in the pregnant (4.28 ± 0.46), whereas the control showed 5.02 ± 0.35 , there was no significant different at $P > 0.05$. The mean value of HGB was low in the Pregnant (11.35 ± 1.24), while in the control was 14.10 ± 1.10 with significant different at $P \leq 0.05$. In addition, the mean value of HCT was low in the pregnant (34.66 ± 9.16) compared with the control (41.78 ± 3.22) with significant different at $P < 0.05$ (Table 1 and Fig. 1).

Groups	N	Mean	SD	P value
RBCs	Pregnant	20	4.28	0.061
	Controls	10	5.02	
HGB	Pregnant	20	11.35	0.041*
	Controls	10	14.10	
HCT	Pregnant	20	34.66	0.025*
	Controls	10	41.78	

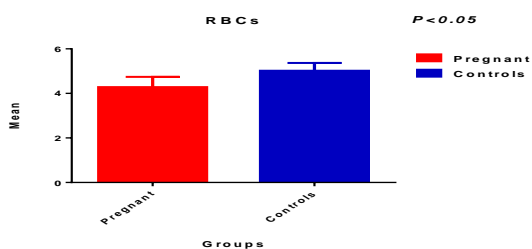


FIGURE 1. Shows the RBCs parameter of pregnant women and control groups.

Result of current study shows the mean value of TT4 was higher in the pregnant (162.76 ± 31.63) than the control (5.02 ± 0.35) with significant different at $P \leq 0.05$. The mean value of FT4 in the pregnant (15.73 ± 2.61) was lower than control (22.11 ± 5.04) but there was no significant different at $P > 0.05$ (Table 2 and Fig. 2).

Groups	N	Mean	SD	P value
TT4	Pregnant	20	162.76	0.001***
	Controls	10	93.54	
FT4	Pregnant	20	15.73	0.381
	Controls	10	22.11	

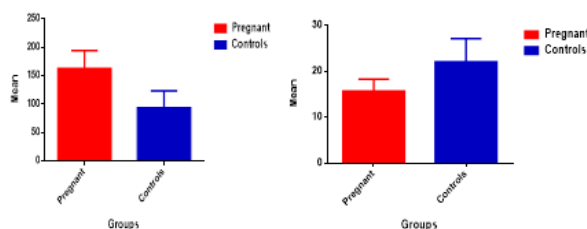


Figure 2. Comparative of TT4 and FT4 parameters of pregnant women and control groups.

The results highest sensitivity of TT4 and FT4 parameters were 100% and 50% respectively, and the sensitivity of RBCs (15%), HGB (12%) and HCT (20%) showed the sensitivity with significant different at $p < 0.05$. Depending on specificity of HgB, RBCs and HCT parameters showed a highest specificity (90%, 70% and 60%) respectively. While, the specificity of TT4 (50%) and FT4 (40%) showed a significant different at $p < 0.05$ (Table 3).

Result of this study showed the RBCs parameter was positive correlation with of HGB ($r = 0.472^*$), TT4 ($r = 0.281$), and FT4 ($r = 0.020$). HCT parameter is positive correlation with RBCs ($r = 0.438$) and HGB ($r = 0.462^*$) while there is a negative correlation with FT4 ($r = -0.167$) and TT4 ($r = -0.095$). FT4 and TT4 showed a high significant positive correlation ($r = 0.0587^{**}$) (Table 4).

Variables	Area	Sensitivity %	Specificity %
RBCs	0.098	15	70
HGB	0.033	12	90
HCT	0.170	20	60
TT4	0.100	100	50
FT4	0.49	50	40

		RBCs	HCT	FT4
RBCs	r	1.0	0.438	0.020
	P		0.053	0.934
HGB	r	0.472*	0.462*	0.239
	P	0.036	0.040	0.309
TT4	r	0.281	-0.095	0.587**
	P	0.231	0.689	0.006
FT4	r	0.020	-0.167	1.0
	P	0.934	0.481	

r= person correlation, P= probability

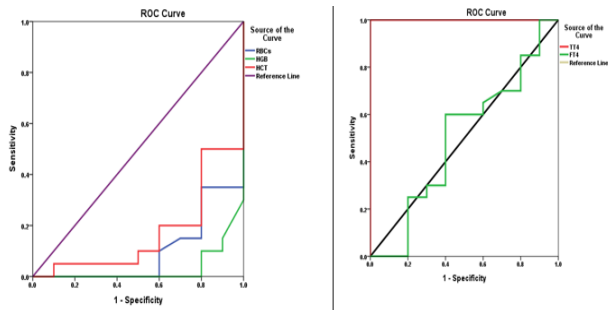


Figure 3. ROC curve, sensitivity, and specificity of variables

4. Discussion

The results of this study shows the significant decreases of RBC, HGB and increases HCT in pregnant women compared with the control group, these results were compatible to previous studies that showed low levels of hematological parameters in pregnant than controls. The increasing number of erythrocytes is by somehow less than increasing of plasma volume, the total net concentration of hemoglobin (Hb) is considered to evaluate the physiological anemia during pregnancy stages [5]. During the pregnancy, the anemia might occurred when the Hb value is less than 110 g/l among the women, the abnormal blood profile might affects pregnant ladies and their babies. Many important hematological disorders might cause maternal morbidity and mortality that because of anemia or preeclampsia during pregnancy period [6]. Underline of Iron deficiency in the case of malnutrition of pregnant women that leads to the iron deficiency anemia might cause the maternal or baby mortality. However, inadequate iron in the diet or in the case of malabsorption disorders, it might lead the Hb less than 110 g/L that called pregnant iron deficiency anemia [7]. Previous report confirmed that hematological disorders of pregnancy, which called “anemia” when less than the Hb < 110 g/L that is based on age and stage of pregnancy [8].

Result of current study showed the TT4 was highest in the pregnant with significant different at $P < 0.05$, while the FT4 was the lowest with no significant different. The result of this study compatible with [9] who reported the high levels of TT4 and low levels FT4 in the pregnant women. In contrast, previous study showed that there is no differences of serum FT3 and FT4 levels in pregnancy and these results disagree with our study [10].

It is about 25% of the total T4 is increased specially in the second trimester of pregnancy compared to first trimester and it is about 35% in case of non-pregnant women [9]. In the non-pregnant ladies, the disorders of the thyroid function may played a role of inappropriately thyroid status. Current, the status of measuring FT4 and TT4 guideline in the pregnancy-adjusted reference range is a highly reliable means of estimating hormone levels during last part of pregnancy [11].

The results of this study showed the TT4 and FT4 parameters with a significant and highest sensitivity when compared with sensitivity the parameters of RBCs HGB and HCT. In addition, the specificity of RBCs, HGB and HCT parameters showed a significant different and highest

specificity compared with specificity of others parameters of TT4 and FT4. These results are agreed with previous study that mentioned the diagnostic analysis performed of thyroid tests such as T3, TT4, and the CBC, RBC, Hemoglobin, lipid profile showed high sensitivity with serum TSH, free T4, and T3 concentrations. In sensitivity analysis of thyroid functions tests compared with the normal base line of hemoglobin a high level of C-reactive protein (CRP) [12], Li et al. [13]. reported the sensitivity and specificity of TSH are detected with high FT4, in same time the minimum ROC is detecting a high FT4 resulted if active TSH. A high specificity was achieved at a level of TSH of low free T4 detection, these results are confirmed by this study.

Result of this study showed the RBCs parameter was positive correlation with of HGB, TT4, and FT4, and HCT parameter was positive correlation with RBCs and HGB, while there was a negative correlation with FT4 and TT4. The correlation of TT4, FT4, TT3, and FT3 with TSH was statistically significant in patients with hypothyroidism are the most valuable indicators in assessing thyroid function in a healthy population [14]. Previous study indicated that there are states of hypothyroidism disorders that correlates with severity status of eclampsia and effects the maternal outcomes [15]. Increased prevalence of thyroid disorders and iron deficiency anaemia in antenatal cases and there is relationship between iron deficiency anaemia and hypothyroid cases [16]. Serum FT4 correlated positively with HB and ferritin, while TSH correlated negatively with HB and ferritin in pregnant women [17].

Free T4 might associated influence of erythrocytes whereas thyroid hormones pay a roles in the regulation of erythropoiesis [18, 19]. The Iron deficiency in case of early pregnancy might effects the thyroid function and could lead to hypothyroidism and thyroid autoimmunity. Recently, the new guideline of the hypothyroidism treatment is might decrease the risk factors of anemia in the second trimester of pregnancy compared to the first trimester [20].

5. Conclusion

The red blood cells coefficient, HGB, HCT was lowest in the pregnant women. The mean value of the TT4 coefficient was high in the pregnant women, while the mean value of the FT4 coefficient was low in pregnant women. The highest sensitivity was with TT4 and FT4, while the lowest seen with RBCs HGB and HCT. The specificity of HgB, RBCs and HCT was the highest, while, the lowest was in the TT4 and FT4.

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