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ASSOCIATIONS BETWEEN SUPEROXIDE DISMUTASE, MALONDIALDEHYDE AND AGE, BMI IN HYPERTHYROIDISM WOMEN OF IRAQI POPULATION.

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ABSTRACT

Background & Aims: Oxidative stress (OS) involves in the complication of many diseases. The imbalance between oxidative stress and antioxidant acts a chief contribution in occurrence and progress of hyperthyroidism. This research designed to measure the serum oxidative stress biomarkers which include the activity of Superoxide Dismutase (SOD) and malondialdehyde (MDA) in both newly diagnosed hyperthyroidism women and control as well as to investigate the association of these biomarkers with age and BMI in hyperthyroidism women. The study included 75 hyperthyroidism women and 75 euthyroid healthy women of identified age , weight , height , and bio-chemical representation of the thyroid function. Results: The serum MDA concentration in patients with hyperthyroidism is significantly ($P < 0.01$) increased compared to control group, while the serum SOD concentration in the hyperthyroid women is reduced significantly ($P < 0.01$) in compared to control. Correlation analysis revealed that body mass index (BMI) is significantly correlate with MDA ($r = 0.245$, $p = 0.041$) and SOD ($r = -0.359$, $p = 0.043$) but there is no correlation between age and any of SOD or MDA levels. Conclusion: This result determine that oxidative stress , antioxidant level and body mass index play a character in the hyperthyroidism pathogenesis.

Key words: SOD activity, MADA, hyperthyroidism, BMI, age.

I. INTRODUCTION:

In normal conditions, human body is formed reactive oxygen species (ROS) during normal metabolism and they are limited by the antioxidants which represent the device of defense in the individuals and work in perfect balance with these ROS, but when the level of ROS is higher than the level of antioxidants this balance will be destructed and oxidative parameters will be increase and oxidative stress would be occur. Malondialdehyde is the end stable product of lipid peroxidation (Karaca and Güder, 2009; Bulut et al., 2013). Another cause can result in oxidative stress is obesity (Skrzep-Poloczek et al., 2020).

Superoxidase dismutase is an antioxidant enzyme which is accountable for removing ROS which are derived from oxygen like superoxide and it is considerably prompted by oxidative stress. (Camkurt et al., 2016).

Hyperthyroidism characterizes by hypermetabolic condition which is related with OS, Thyroid hormone have a performance in variable the basic metabolism status and in the metabolism of oxidation. This hormone is able to produce a large alterations in the respiratory chain compounds activity of in mitochondria which can lead to increasing the production of reactive oxygen species (Mano et al., 1995 ;Klein & Danzi, 2016) which able to cause oxidative stress in lipids and proteins (Araujo *et al*., 2006)

In this research, we intended to measure the concentrations of oxidative stress biomarkers, including serum superoxide dismutase activity and malondialdehyde in both newly diagnosed hyperthyroidism women and

euthyroid women as well as to investigate the relationship of these biomarkers with age and BMI in hyperthyroidism women.

II. METHOD

Participants

The samples of blood were collected from 75 hyperthyroidism women and 75 euthyroid healthy women as control group who were intended to Teaching Hilla Hospital. The ages , weight and the high of these participant were measured and every hyperthyroidism patient who were suffering from disease that can relate with increased oxidative stress such as : cancer, pregnancy, diabetes, cardiovascular disease, hypertension, as well as using hormone therapy and treatment with antioxidant supplement for at least six months before the participation in this study have been excluded from this study.

Measurement of biochemical, SOD and Oxidative stress parameters:

TSH, T3 and T4 were measured by the immunoassay method. The activity of SOD was measured according to a procedure that was mentioned by previous study (Sun et al.,1988) and was alternated by another researcher (Durak *et al*. ;1993) . The activity of S O D is stated by U/L. The level of lipid oxidation is quantified by MDA, which was measured depending on procedure described in previous study by Janero (1990) . The level of MDA was stated as µ mol/ml.

Statistical analysis

It was done by SPSS programme . Descriptive statistics (mean and standard error), Student's t-test and Pearson correlation coefficient were used.

III. RESULTS

The participants were subdivided into groups according to age in one time and according to BMI in another time, as show in table (1).

Table (1): Frontier characteristics of the participants in this study.

variables	Patients n=75	Control n=75
Age (years)		
20 -29	15 (10 %)	18 (12 %)
30 -39	60 (40 %)	57 (38 %)
BMI		
BMI < 25	70 (46.66 %)	67 (44.67 %)
BMI ≥ 25	5 (3.34 %)	8 (5.33 %)

BMI : body mass index.

The biochemical representation of the thyroid function for these participants are showed in table (2).

Table(2): Thyroid hormones in euthyroid women and hyperthyroidism women.

Parameters	Control n =75	Patient n=75	P value
	Mean ± S.E		
TSH (µU / ml)	1.79±0.14	0.03±0.003	0.0001**
T3 (n mol / L)	1.75±0.03	4.78±0.21	0.0001**
T4 (n mol / L)	85.99±1.25	195.07±11.74	0.0001**

** refers to a significant difference $p < 0.01$.

The result show that MDA concentration is increased significantly($p < 0.01$) in patients than control. SOD activity was significantly ($p < 0.01$) decreased in patients than control, as show in figure (1) and figure (2) .

The analysis of association showed a significant negative association ($r = -0.359$, $p = 0.043$) among SOD and body mass index, while the correlation between MDA and body mass index is significantly positive correlation ($r= 0.245$, $p=0.041$), but there is no correlation between age and any of SOD or MDA levels, as show in figure (3).

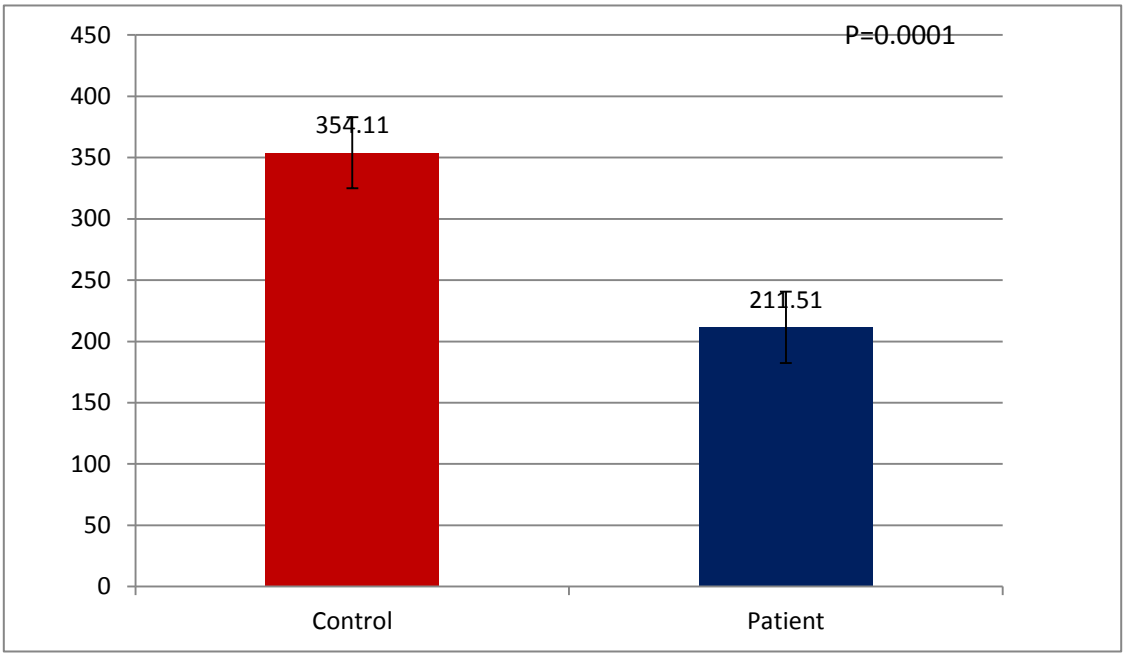

Figure (1): Mean serum SOD levels represented as U/L in hyperthyroidism women and healthy euthyroid women.

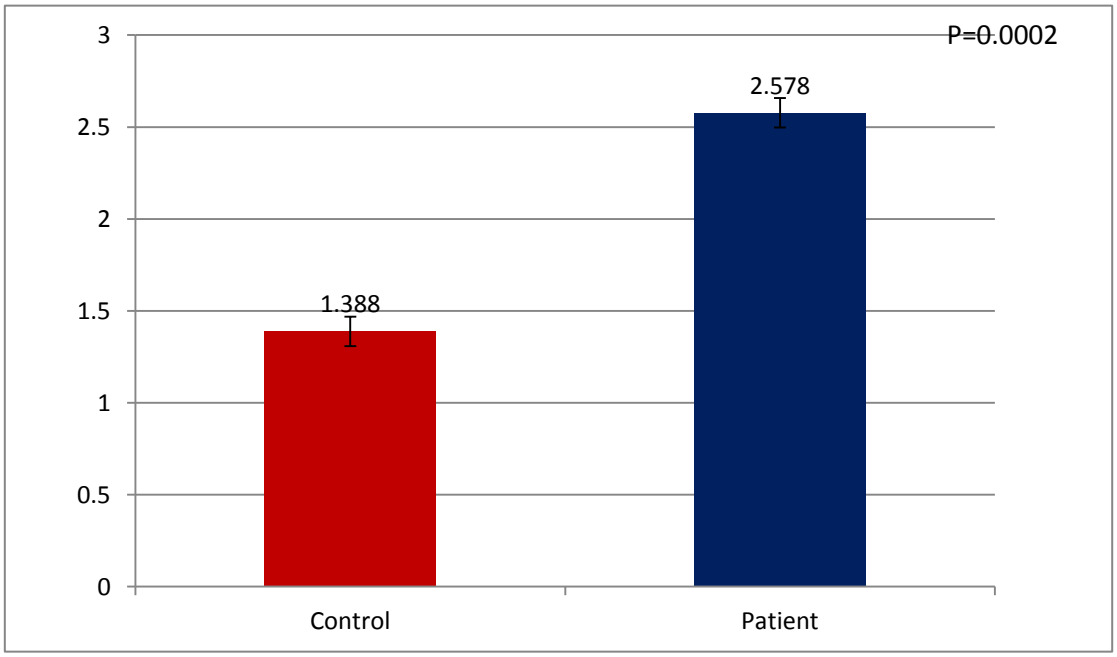

Figure (2): Mean MDA levels represented as µ mol/ml in hyperthyroidism women and healthy euthyroid women.

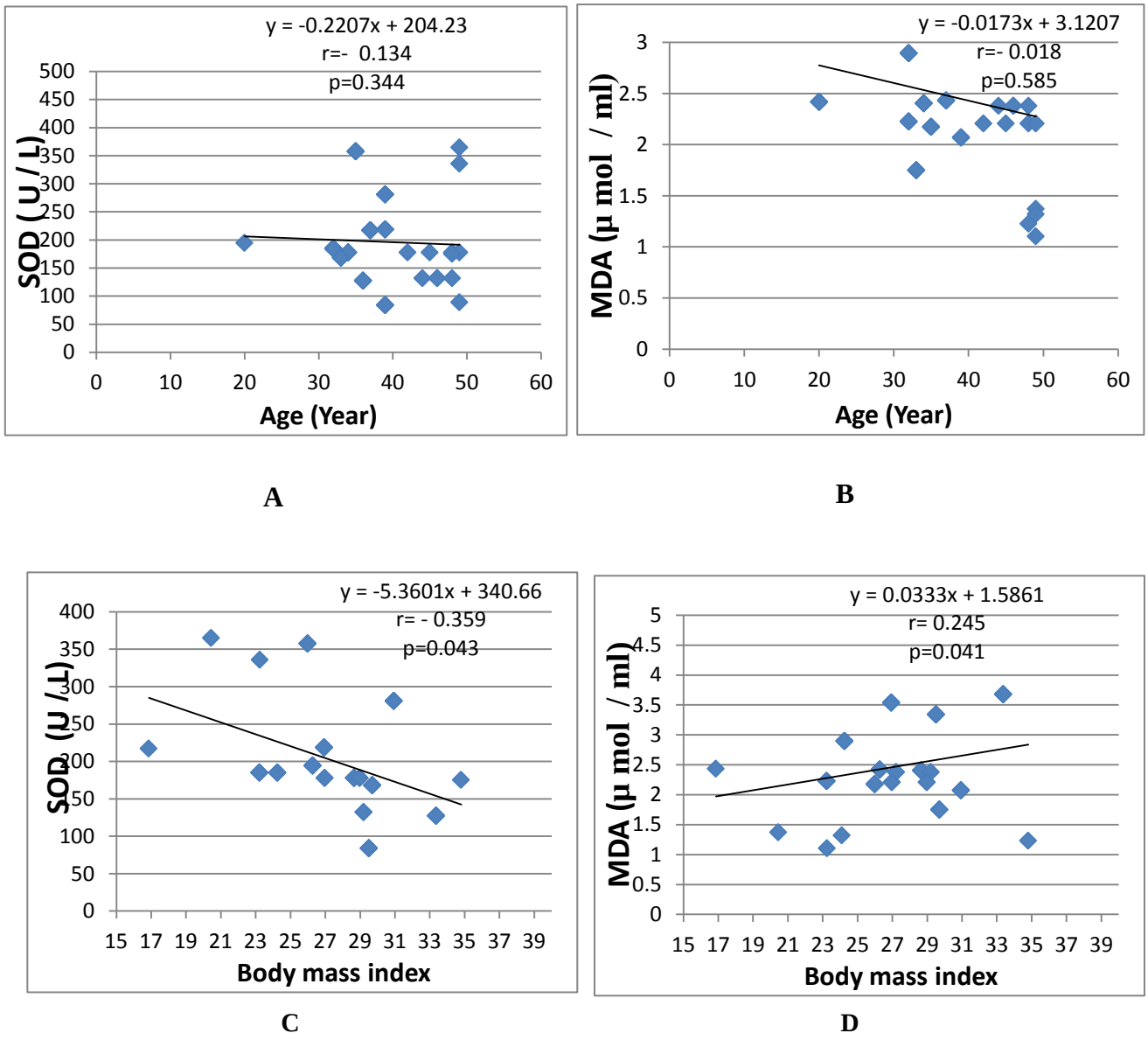

Figure (3): correlation analysis of oxidative stress in hyperthyroidism women

IV. DISCUSSION

Our hyperthyroidism patients demonstrated significant($p < 0.01$) reduction in activity of SOD and significantly increasing ($p < 0.01$) in MDA level than in control and this result is agree with Cheng et al.,(2018) who reported a negative association among malondialdehyde and superoxide dismutase. High production of MDA represents increased oxidation in the condition of disease and decreased SOD level refer to diminishing in the mechanisms of antioxidant (Findikli et al., 2018).

In the current study, the elevation in serum levels of MDA in hyperthyroidism women than in control may be due to high concentrations of thyroid hormones in these patients. Thyroid hormones increase the basic metabolism, oxygen consumption, oxidative capacity and free radicals formation which result in peroxidation of cell membrane fatty acids to create malondialdehyde , which is a stable end product of lipid peroxidation (Mogulkoc et al., 2005; Spiteller, 2007; Petrulea et al., 2012) while the significant decreased in the SOD activity in hyperthyroidism women may refer to de gradation of SOD by ROS during the detoxification events (Akyol et al., 2001) or may be attributed to the inactivation of de- novo synthesis of the enzyme next the incessant and high creation of the antioxidants in the first few days in response to hyperthyroidism and they can neutralize these free radicals while with passing the time the antioxidant defenses may be exhausted (Kalpakcioglu et al. ,2008).

In this study, the association analysis was showed a negative association (r = -0.359 and P = 0.043) among SOD and body mass index and a positive correlation (r= 0.245 and P=0.041) between MDA and body mass index. This result is agree with several studies: Skrzep-Poloczek et al., (2020) who reported that Obesity was augmented lipid destruction and diminished the activity of antioxidant enzymes, and (Demori et al., 2006) who illustrate that maintaining on high fat diet was caused increasing in body mass index and oxidative stress . This impact may be due to the role of visceral fat tissue in increasing ROS production (Hermsdorff et al., 2011)

Conclusion: These findings conclude that malondialdehyde levels were increased and superoxide dismutase level was significantly decreased in hyperthyroidism women . Oxidative stress , antioxidant level and body mass index show a role in the pathogenesis of hyperthyroidism.

So, we can be recommended that the adjustment thyroid hormone and antioxidant level can play an important role in the strategies of hyperthyroidism therapy.

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