

# Evaluation of Thyroid Peroxidase Enzyme Level and Its Relationship with a Number of Enzyme Antioxidants in Thalassemia Patients in Salah al-Din Governorate

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**Abstract:** *The research aims to study the evaluation of the level of the thyroid peroxidase enzyme and some of the enzyme antioxidants (catalase CAT, glutathione peroxidase GPX, superoxide dismutase SOD) among thalassemia patients in Salah Al-Din Governorate. The research included (90) samples, (45) samples with Thalassemia and (45) healthy sample and described them as the control group. Their ages ranged between (9-30) years, and the results showed a decrease in the studied biochemical indicators. A significant decrease was found as the activity of the thyroid peroxidase enzyme (TPO) was recorded in Thalassemia patients, ( $58.4 \pm 3.7$ ) compared with the healthy group ( $261.7 \pm 24.7$ ). Also, there was a significant decrease in the activity of SOD enzyme in Thalassemia patients ( $278.1 \pm 32.8$  \*) compared with the healthy group ( $329.6 \pm 58.6$ ). No significant difference was found in the activity of the glutathione peroxidase enzyme GPX in thalassemia patients ( $20.0 \pm 7.0$ ) compared with the healthy group ( $20.7 \pm 7.7$ ). Also, there was no significant difference in the activity of catalase enzyme CAT in thalassemia patients ( $168.9 \pm 25$ ) compared with the healthy group ( $166.4 \pm 26.7$ ). The statistical results showed a negative correlation between the thyroid peroxidase enzyme and (glutathione peroxidase, superoxide dismutase) and a positive correlation between the thyroid peroxidase enzyme and catalase with varying correlation coefficient values.*

**Keywords:** *thalassemia, TPO, CAT, GPX, SOD.*

## INTRODUCTION

Thalassemia is regarded as a type of acute anemia characterized by a deficiency of a specific globin chain. Thalassemia leads to a decrease in the level of hemoglobin (Hb) in the red blood cells, as a result of a loss or decrease in the production of one or more of the multi-peptide chains of the globin chain. Alpha or beta, resulting in anemia, or what is known as anemia, as hemoglobin loses its main function in transporting oxygen O<sub>2</sub> and carbon dioxide CO<sub>2</sub> inside the living organism, followed by a decrease in the percentage of oxygen to cells (Weatherall, D.J. 2010).

The word Thalassemia is a Greek word taken from thalassa, which means sea or sea, and it means blood or blood ( Rund, D.; and Rachmilewitz, E. 2005 ), as this disease spreads in particular among the peoples of the Mediterranean, the Middle East, Asia and other countries of the world, and this geographical link was responsible for calling it Thalassa, as she indicated Research indicates the spread of beta thalassemia in Iraq, as the percentage of carriers of the

disease reached from (5-4.5%) ( Al-Allawi, et al.,2010 ). Thalassemia can be classified into alpha-thalassemia or beta-thalassemia, and thus beta-thalassemia can be classified into three types: thalassemia major, thalassemia intermediate and thalassemia minor. Thalassemia is treated with blood transfusions periodically every 3 to 4 weeks to maintain normal hemoglobin, which contains Iron, which leads to high levels of iron inside the recipient's body, and thus daily administration of the drug, such as (Desferal injection) under the skin to remove excess iron in the body ( Hong et al., 2013 ). Thyroid peroxidase oxidizes iodide ions to form iodine atoms, which are added To Tyrosine on Thyroglobulin to produce T3, T4 thyroid hormones. This type of TPO enzyme is stimulated by the hormone TSH, which regulates genetic change, and is also inhibited by Thioamide drugs such as Propylthioure and Methimazole. Consuming soy-containing food with goiter, hypothyroidism and immune thyroid disorders, patients with different levels of TPO autoantibodies ( Chadha and Goel, 2009 ). Antioxidants: They are a defense system (protective) against oxidative stress caused by active oxygen atoms (free radicals) for the purpose of protecting body cells from free radical damage, as they are complex molecules with biochemical properties that are extremely important to the bodies of living organisms. One of its most important features is its ability to inhibit the effectiveness of free radicals and their formation process, and to remove free radicals in the event of their formation, as they are electron donating compounds that interact with free radicals, and are ineffective compounds that do not have the ability to attack the cells of the body .As it is known, antioxidants become more important with the increased exposure to free radicals from various pollutants, as they are found inside the body of the organism in the form of enzymes, elements, enzymatic companions, or compounds containing reduced sulfur such as glutathione, as well as some vitamins such as Vit C, Vit E. Also, the level of antioxidants can change according to the pathological condition, so those levels decrease in diseases associated with an increase in the oxidation process ( Kefer, et al., 2009 ).

**The aim of the study:** to measure the level of thyroid peroxidase (TPO), superoxide dismutase (SOD), glutathione peroxidase (GPX) and catalase (CAT).

### **Work Method**

The research samples were collected from thalassemia patients in Tikrit General Hospital, and 45 samples were obtained from the injured, as well as 45 samples were collected from healthy people for comparison, and the ages of the samples ranged between (9-30) years The concentration of TPO in the blood was determined by ELISA using the diagnostic kit supplied by SHANGHAI YEHUA Biological Technology of China.

As for the estimation of the SOD concentration in the blood of patients and healthy people using the ELISA test, according to the instructions contained in the examination kit supplied by the American company Elabscience. GPX was estimated by the method used and the number supplied by the American company Elabscience. As for the CAT catalog, it was estimated by the equipment supplied by the American company MYBIOSOURCE.

## RESULTS AND DISCUSSION

Table (1) Comparison of some biochemical indicators between healthy ones and thalassemia patients

Parameters	Groups	Mean $\pm$ SD	P value (T test)
TPO (Pg/ml)	Patients = 45	58.444 $\pm$ 13.777**	P<0.05
	Control = 45	261.762 $\pm$ 24.785	P<0.05
SOD U/ml	Patients = 45	278.131 $\pm$ 32.869*	P<0.05
	Control = 45	329.657 $\pm$ 58.641	P<0.05
GPX ng/ml	Patients = 45	20.008 $\pm$ 7.068	P<0.05
	Control = 45	20.753 $\pm$ 7.734	P<0.05
CAT U/ml	Patients = 45	168.937 $\pm$ 25.083	P<0.05
	Control = 45	166.480 $\pm$ 26.753	P<0.05

The results of the current study, as in table (1), state a comparison of some biochemical variables between healthy people and patients with thalassemia, as it is noticed that there's a significant decrease in the level of thyroid peroxidase (TPO) enzyme activity in thalassemia patients compared with the healthy group. The concentration of TPO enzyme in the blood of thalassemia patients was also studied and compared with the healthy ones according to the age groups of the study samples, as they were divided into two groups (19-9) (20-30 years old). While the results indicated, as shown in Figure (1), that there was significant differences at between the two groups of both patients and healthy people.

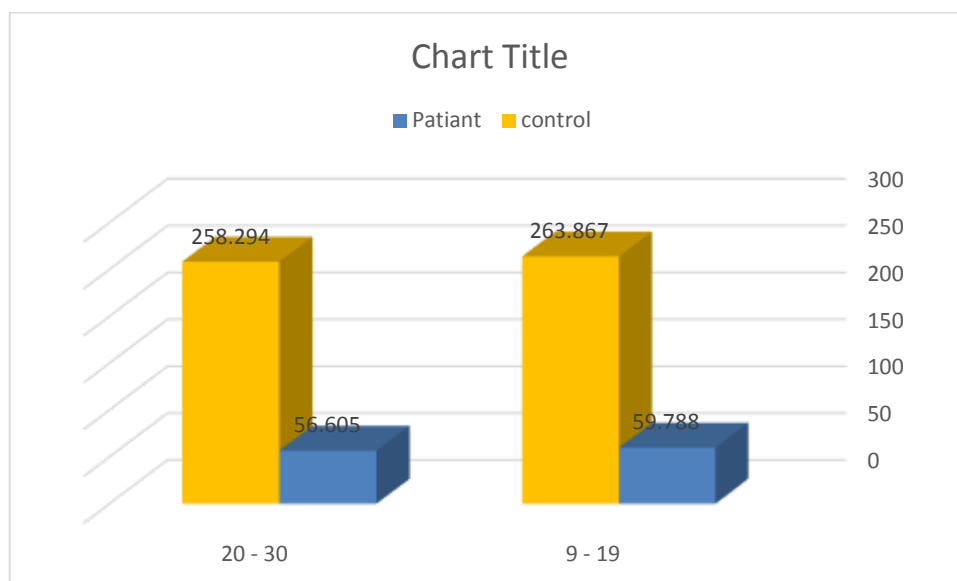


Figure (1) The activity of thyroid peroxidase enzyme in the blood of patients with thalassemia compared to healthy subjects according to age groups

A significant decrease was found in TPO enzyme activity in thalassemia patients compared to the healthy group, and these results are consistent with what was mentioned by (Zaid et al., 2019; Elia, et al., 2019 ) in their previous studies. Thyroid dysfunction is one of the disorders of thyroid hormones that occur frequently among thalassemia patients, and the severity of the disorder varies due to several factors, but it is not fully defined (Drema et al., 2017 ). The phenomenon of hypothyroidism among thalassemia patients is one of the hemolytic anemia diseases that leads to increased destruction of red blood cells, and may be partial. Hypothyroidism due to blood transfusion. Excess iron intake leads to gland dysfunction. Another study suggests that endocrine damage causing chronic hypoxia caused by prolonged anemia may be a related factor responsible for thyroid dysfunction (Agarwal et al.,1992 ; Mustafa et al., 2020 ; Al-Samarrai et al., 2019 ). A significant decrease was found in the level of SOD enzyme in Thalassemia patients compared with the healthy group. The level of SOD enzyme in the blood of thalassemia patients was also studied and compared with the healthy ones according to the age groups of the study samples, as they were divided into two groups (19-9) (20-30 years old). SOD enzyme, while the results indicated, as shown in Figure (2), that there were significant differences between the two groups of both groups for both patients and healthy ones.

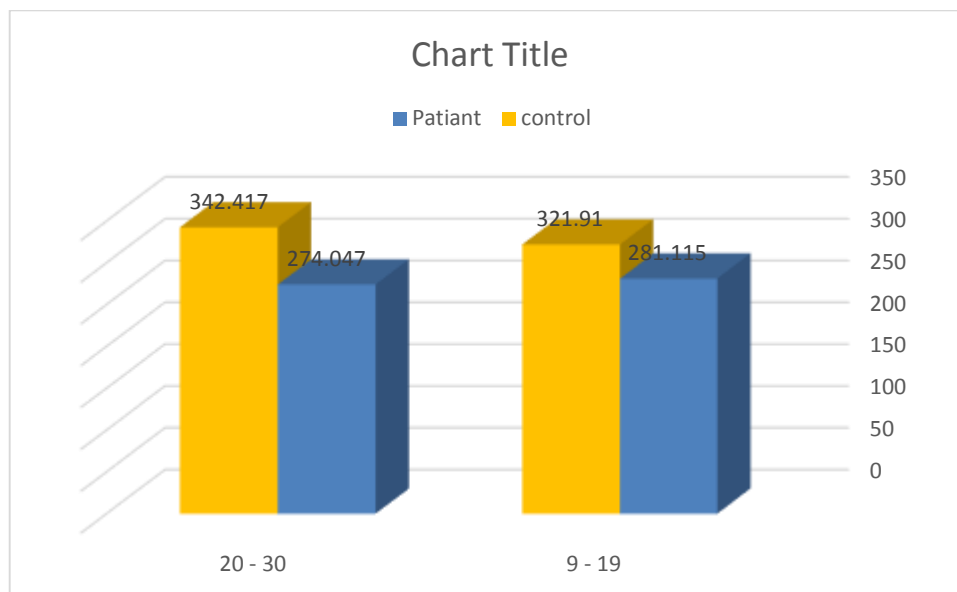


Figure (2) the level of the enzyme SOD in the blood of people with thalassemia compared to healthy people according age group

No significant difference in glutathione peroxidase GPX enzyme in thalassemia patients compared with the healthy group. (9-19) (20-30) years old, as it was noticed when comparing the two groups within the same group that there were no significant differences in the level of GPX enzyme, as shown in Figure (3).

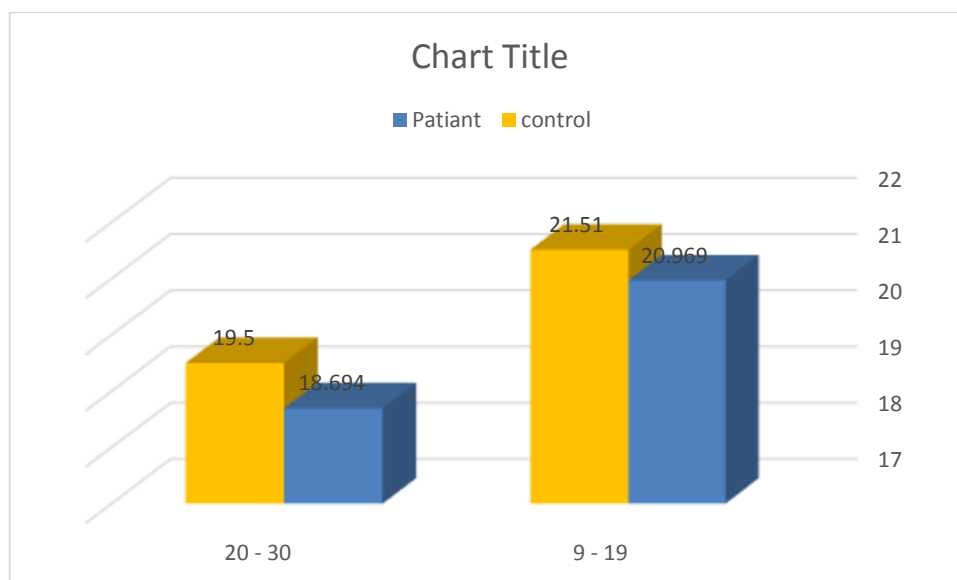


Figure (3) The level of GPX enzyme in the blood of people with thalassemia compared to healthy ones according age group

No significant difference was found in the CAT enzyme in thalassemia patients compared with the healthy group. The level of GPX enzyme in the blood of thalassemia patients was also studied and compared with the healthy ones according to the age groups of the study samples, as they were divided into two groups (19-9) (20-30 years old), as shown in Figure (4)

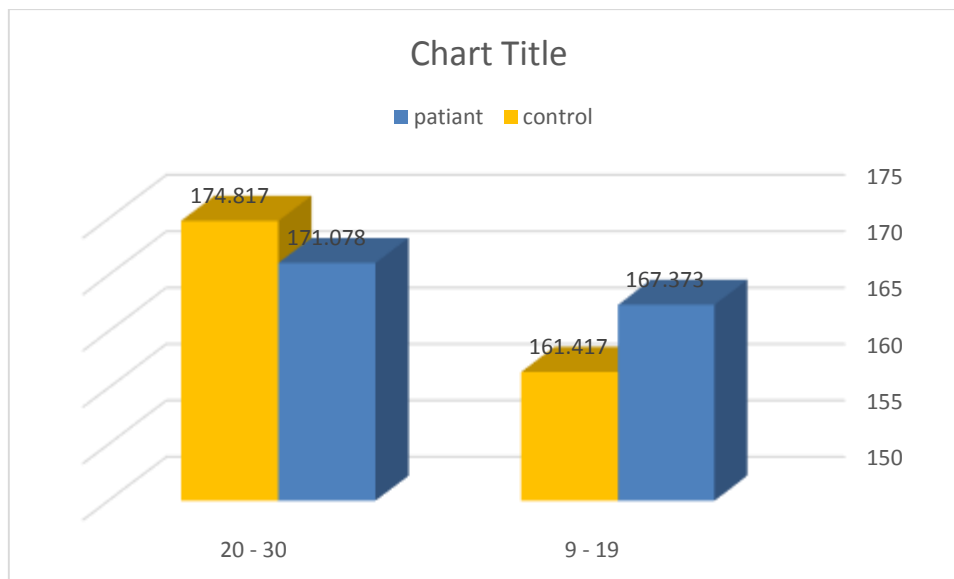


Figure (4) The level of CAT enzyme in the blood of people with thalassemia compared to the healthy ones according age groups

The results stated above showed a significant decrease in the SOD enzyme activity in thalassemia patients compared to the healthy group, and these results are almost consistent with what the researchers mentioned, (Husam, 2018 ; Mahal, et al., 2019 ; Nafady, et al., 2017; Abdulwahed et al.,2020 ) in his previous studies conducted on patients with beta thalassemia minor.

Due to the lack of a previous study to measure the level of the enzyme from thalassemia patients, and the reason for the low level of the enzyme may be attributed to the massive accumulation of free radicals due to excessive iron concentrations (caused by absorption from food and ineffective red blood cells that break down to release iron). Iron can accelerate the conversion of molecular oxygen to reactive oxygen radicals, peroxides, and hydroxyl groups through the Fenton reaction in which the ferrous iron ion reacts with hydrogen peroxide to form a hydroxyl radical (Halliwell, 1992). The accumulation of these substances causes a decrease in the activity of the enzyme. It is expected in the previously mentioned studies that the accumulation of iron and the rest of the elements may affect the structural shape of the enzyme, since these elements constitute an essential part of its composition and therefore a change occurs in the way it works and this affects the activity of the enzyme. As for ( CAT, GPX) The above results showed that there were no significant differences in their concentrations, and these concentrations were within the normal level of enzymes, and this differs with the findings of researchers in their previous study ( Mohammed et al., 2020 ; Mustafa & AL-Samarraie, 2020 ; Alkanaani et al.,2020 ; Abdulrahman et al., 2020).

### **Linear Correlation between the level of TPO and the clinical variables studied with it in Thalassemia patients**

To find the correlation between the thyroid peroxidase enzyme and a number of clinical variables that were measured in thalassemia patients and the healthy group, the linear correlation coefficient “r” was found between the enzyme and the variables, as the correlation coefficient (r): is a measure of the degree of correlation or commitment between two variables.

They are used to describe the relationship and the degree of correlation between the various studied variables, as follows:

Table (2) shows the correlation coefficient of thyroid peroxidase (TPO) with the studied variables

variables	Patients		Healthy ones	
	r	P value	r	P value
SOD	-0.150	0.325	-0.018	0.907
GPX	-0.164	0.281	0.041	0.787
CAT	0.063	0.679	-0.061	0.692

### 1. Correlation relationship between the levels of the enzyme thyroid peroxidase (TPO) with SOD

There was negative linear correlation between the levels of thyroid peroxidase (TPO) with the enzyme superoxide dismutase (SOD) for thalassemia patients. As the value of the correlation coefficient between them is ( $r = -0.150$ ), and in the healthy, the value of the correlation coefficient is ( $r = -0.018$ ) and the figure (5) below shows the form of the linear relationship between the concentration of the enzyme and the concentration of SOD

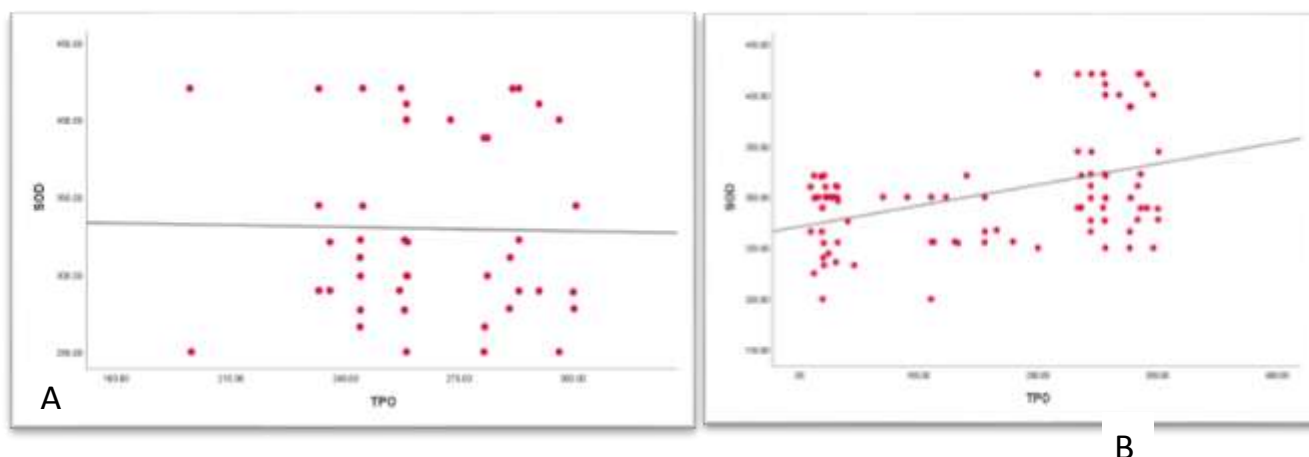


Figure (5) Correlation of TPO with SOD (A: for healthy people, B: for patients)

### Correlation between the levels of thyroid peroxidase (TPO) with GPX

The correlation between the level of thyroid peroxidase enzyme and glutathione peroxidase in the blood of patients was negative, as the value of the correlation coefficient was ( $r = -0.164$ ), while the relationship with healthy people was a positive relationship with the value of the correlation coefficient ( $r = 0.041$ ), as in Figure (6-1).

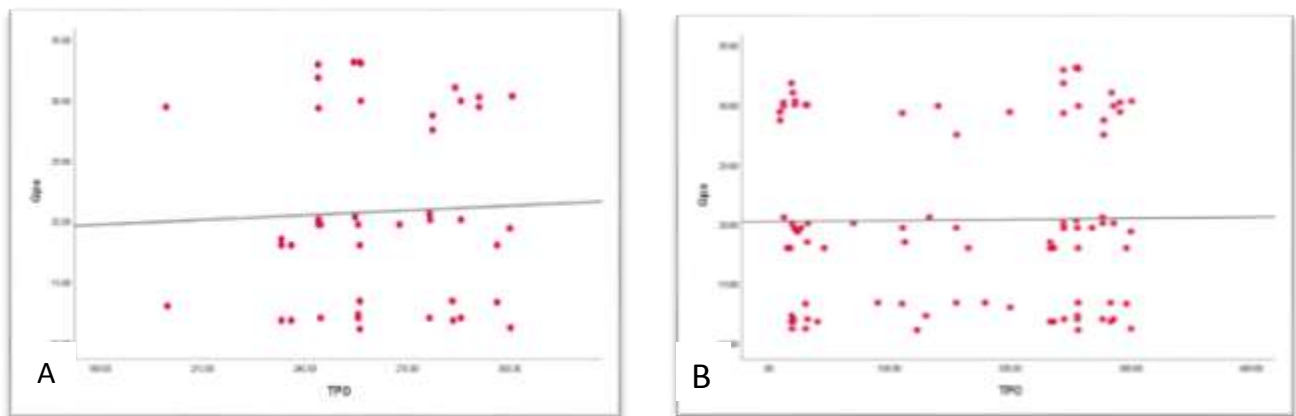


Figure (6) Correlation of TPO with GPX (A: for healthy people, B: for patients)

### Correlation relationship between the levels of thyroid peroxidase (TPO) with CAT

The correlation was positive between the level of thyroid peroxidase enzyme and catalase in the blood of patients, as the value of the correlation coefficient was ( $r = 0.063$ ), while the relationship with healthy people was a negative relationship with the value of the correlation coefficient ( $r = -0.061$ ), as in Figure (7).

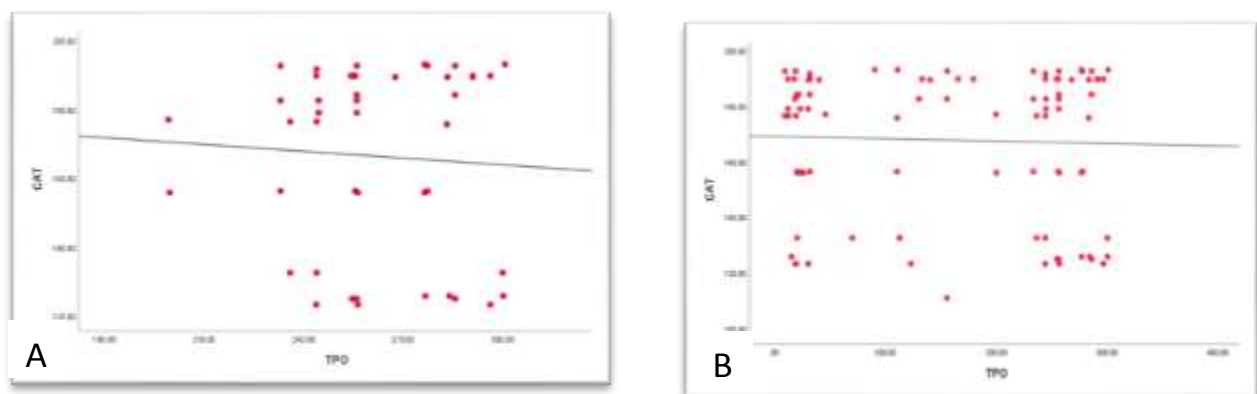


Figure (7) Correlation of TPO with CAT (A: for healthy people, B: for patients)

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