Study the effect of oxidative stress in patients with stomach ulcers in Anbar Governorate

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Abstract
Background: Stomach ulcer disease (SUD) is common in most parts of the world, where ulcers are caused by inflammation of the stomach lining. SUD affects more than 10% of the world's population. It is one of the most common digestive problems. SUD may occur as a result of endothelial damage when there is an imbalance between defensive factors (gastric mucosal barrier, bicarbonate secretion, and elevated blood flow). Aggressive infectious agents (acid, pepsin, H. pylori, and refluxing bile salts). Oxidative stress is defined as a relative increase of (ROS and RNS) as compared to antioxidants. the stomach mucosa contains an effective enzymatic system that scavenges ROS and prevents them from causing havoc on the mucosa. The capacity of a non-enzymatic antioxidant defense system is reflected in TAC. SOD protects tissues in the stomach by converting the highly harmful radical superoxide (O2) to the less reactive peroxide (H2O2), which CAT can then remove to produce water and oxygen. Methods: We enrolled 60 patients divided into thirty males and thirty females with SUD and 60 healthy controls divided into thirty males and thirty females' individuals who did not have the disease and had no history of smoking or drinking alcohol. We measure serum (Total Antioxidants, Super Oxide Dismutase, Malondialdehyde). Results: Serum (TAC, SOD, MDA). levels were significantly decreased in SUD patients compared to controls.
Keywords: oxidative stress; Anbar Governorate; stomach ulcers

1. Introduction

Stomach ulcers are a common digestive disease that, if not treated quickly in a short time, can progress to more serious conditions such as stomach cancer (1),(2) and it is one of the most common disorders in the world..(3) and it SUD affect more than 10% of the world's population. (4)(5) The Symptoms of stomach ulcers include weight loss (6), abdominal pain, nausea, Anorexia, vomiting, stools containing blood,(7) bloating, gas and fever. (8) The main causes of stomach ulcers are Nonsteroidal anti-inflammatory medicines (NSAIDs) (9), Diet (2)(10), Smoking (11), Alcohol drinking (12), Zollinger-Ellison syndrome (ZES), (13) Helicobacter pylori (*H.pylori*)(14)(15), and Oxidative stress. (16)(17). Oxidative stress is defined as a relative increase of (ROS and RNS) as compared to antioxidants. [52,53]. It is also a major contender for the origin of stress ulcers, although there is some evidence that psychological stress, physical stress such as surgical intervention, and microbiological infections such as *H.pylori*, contribute to oxidative stress in the stomach.(18) Malondialdehyde (MDA) is a harmful product of lipid peroxidation induced by the breakdown of fatty acid chains.(19).M DA is excreted in part through the kidney. MDA is a popular biomarker for recognizing lipid oxidative damage. (20) Fat peroxidation is induced by FRs such as superoxide anion radicals, hydroxyl radicals, and hydrogen peroxide, which are molecules or atoms with unpaired electrons in their outer orbitals and are particularly reactive to cells or surrounding cell components such as lipids.[81,82] . MDA is a marker of oxidative stress (23) Elevated levels of MDA indicate the presence of oxidative stress (24) TAC is the cumulative activity of all the antioxidants present in plasma and bodily fluids, giving an integrated parameter rather than the mere sum of quantifiable antioxidants.(25) A low total antioxidant capacity may indicate oxidative stress or an increased vulnerability to oxidative damage (26). The capacity of a non-enzymatic antioxidant defense system is reflected in TAC.(27) The kind of oxidation source, target, and measurement employed to identify the oxidized product varies amongst assays for TAC in plasma. (28) It is also the sum of its endogenous and diet-derived antioxidants.(29) Superoxide dismutase (SOD) is an antioxidant enzyme that helps animals and plants defend against FRs produced by stress.(30) SOD deficiency or mutations that impair catalytic activity have substantial phenotypic effects. Additionally, SOD protects the body by turning superoxide into oxygen and H_2O_2 through cyclic oxidation and reduction processes with the active site metal. (31) Plant-derived SOD was delivered as a dietary supplement to animal and human models undergoing oxidative stress, resulting in increased antioxidant circulation and decreased oxidative stress (32).

The present study aimed to determine the serum levels of some Oxidative stress (MDA) and Antioxidants (SOD and TAC) and their adoption as pathological indicators of SUD in the environment of Anbar Governorate

2. Materials and Methods

This study has been conducted at the laboratories of Fallujah maternity and children hospital during the period between November 2021 to May 2022. The

doi.org/10.31838/hiv22.02.597 Received: 25.04.22, Revised:07.07.22, Accepted: 25.08.22

study included 60 cases and 60 control. The study includes 30 healthy males. The age of this group ranged from (30-56) years, and 30 healthy females. The age of this group ranged from (31-51) years. individuals who did not have the disease and had no history of smoking or drinking alcohol. Also the study included 30 male patients. Their ages ranged from (33 - 73) years. And 30 female patients. Their ages ranged from (30 - 70) years. The patients were diagnosed to have stomach ulcers by physicians based on a positive diagnosis in the endoscopy device. They were collected from the AL-Anbar governorate. All patients completed a detailed questionnaire that included their name, age, gender, weight, height, smoking, alcohol consumption, and previous medical history. All of the patients gave their verbal agreement to participate in this study. Five ml of the subjects' blood were drawn from their veins and slowly placed into simple disposable tubes. Gel tubes were used to collect venous blood samples. Samples in gel tubes were allowed to coagulate at 37°C for 10-15 min before centrifugation at 3000 rpm for 10-15 min to produce serum samples, which were then separated into four parts and kept at -20°C until analysis Biochemistry. The following parameters were measured using ELISA technique serum levels of (SOD and MDA). Elabscience (USA) while serum levels of TAC Sun Long Biotech Co.LT (China).

3. Statistics

The data were evaluated using linear regression analysis and the findings were expressed as mean ± SD. SPSS version 23.0 was used to conduct statistical analysis. Statistical significance was defined as a $p < 0.05$.

4. Result

- SOD (pg/ml): the results showed a significant decrease in male group ($p < 0.001$) patients (2190 ± 131) than in the control group (2066 ± 117).

Also in the female group, the results showed a significant decrease ($p < 0.001$) in patients (2078 ± 189) than in the control group (2217 ± 123).

- MDA (ng/ml): the results showed a significant decrease in male group ($p < 0.001$) patients (1439 ± 409) than in the control group (881 ± 166).

Also in the female group, the results showed a significant decrease ($p < 0.001$) in patients (1180 ± 373) than in the control group (703 ± 97).

- TAC (U/ml): the results showed a significant decrease in male group ($p < 0.001$) patients (1.5 ± 0.11) than in the control group (7.4 ± 2.6).

Also in the female group, the results showed a significant decrease ($p < 0.001$) in patients (1.6 ± 0.1) than in the control group (7.9 ± 2.2). The result as shown in Table (1) and Figure (1, 2, and 3)

Table (1) Mean ± Standard Deviation (SOD, MDA, and TAC) Concentration in Sera of Stomach Ulcer Patients and Control Group

Parameters		Control	Patient	*P*-value
		Mean ± SD	Mean ± SD	
SOD (Pg/ml)	M	2190 ± 131	2066 ± 117	0.001
	F	2217 ± 123	2078 ± 189	0.001
MDA (ng/ml)	M	881 ± 166	1439 ± 409	0.001
	F	703 ± 97	1180 ± 373	0.001
TAC (U/ml)	M	7.4 ± 2.6	1.5 ± 0.11	0.001
	F	7.9 ± 2.2	1.6 ± 0.1	0.001

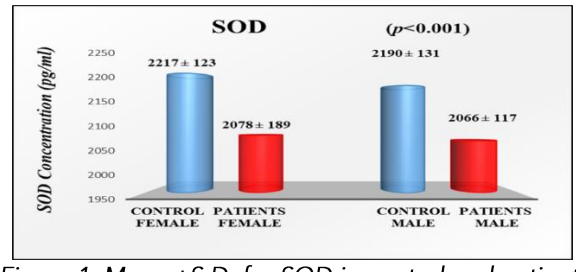

Figure 1. Mean ±S.D. for SOD in control and patients

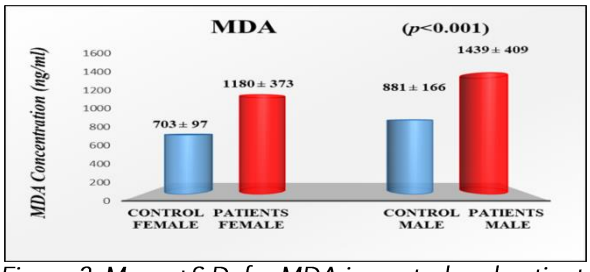

Figure 2. Mean ±S.D. for MDA in control and patients

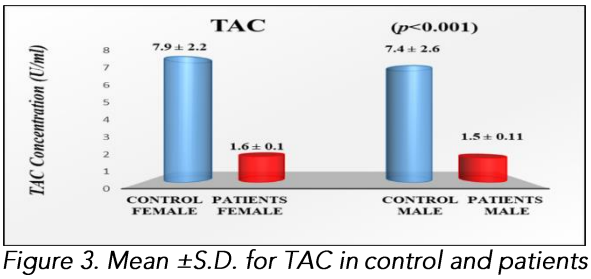

Figure 3. Mean ±S.D. for TAC in control and patients

According to Pearson's male analysis

The findings of linear regression analysis demonstrate that there is a strong positive association $p < 0.05$, r = (0.388) of serum TAC. concentration with SOD and a strong negative association $p < 0.05$, r = (-0.346) of serum MDA. With SOD in the Stomach ulcer patient male group. These correlations are shown in Table (2).and fig. (4and 5).

Table (2): Correlation between SOD with (MDA, and TAC) in the SUD patient male group

Parameters	Correlation coefficient r	*P*-value
MDA (ng/ml)	-0.346	0.007
TAC (U/ml)	0.388	0.002

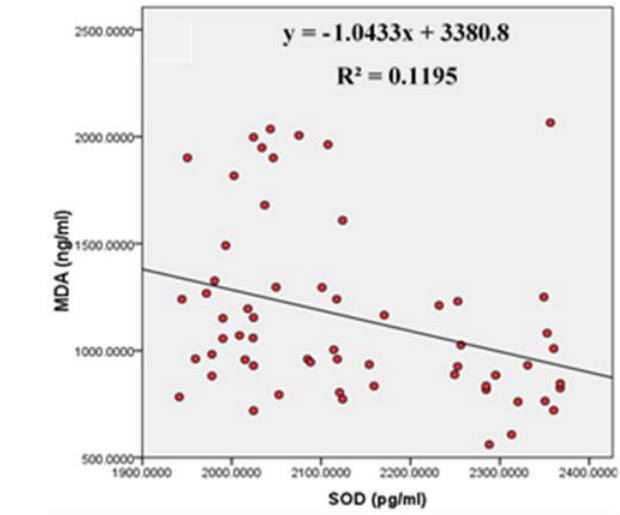

Figure (4) Correlation between SOD with MDA in the SUD patient male group.

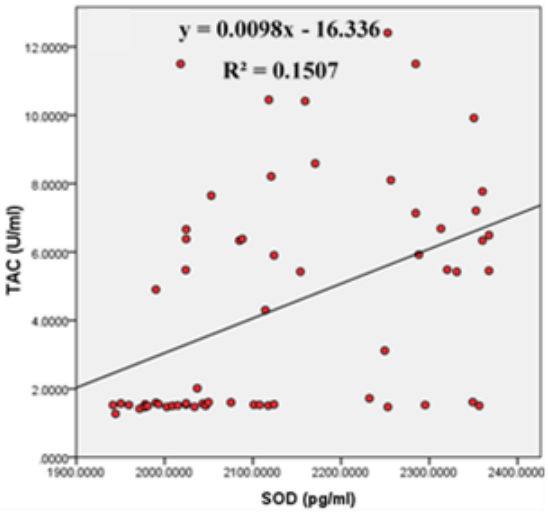

Figure (5) Correlation between SOD with TAC in the SUD patient male group.

Also the results of this study showed a linear regression analysis demonstrate that there is a strong negative association p < 0.05, r = (-0.522) of serum MDA, with TAC in the SUD patient male group. These correlations are shown in Table (3).and fig. (6).

Table (3): Correlation between MDA with TAC in the SUD patient male group		
Parameters	Correlation coefficient r	*P*-value
TAC (U/ml)	-0.522	0.001

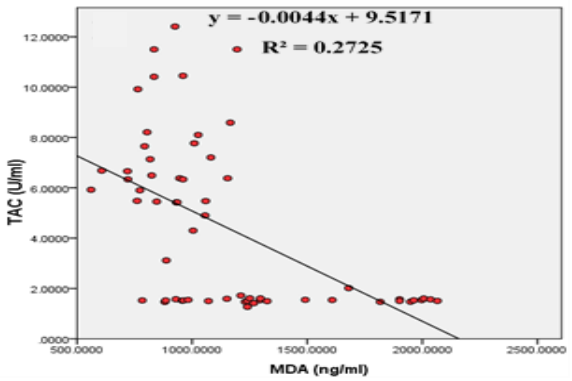

Figure (6) Correlation between MDA with TAC in the SUD patient male group.

Also the findings of linear regression analysis demonstrate that there is a strong positive association p < 0.05, r = (0.328) of serum TAC. concentration with SOD and a non-significant association p < 0.476, r = (-0.094) of serum MDA. With SOD in the SUD patient female group. These correlations are shown in Table (4).and fig. (7and 8).

Table (4): Correlation between SOD with (MDA, and TAC) in the SUD patient female group		
Parameters	Correlation coefficient r	*P*-value
MDA (ng/ml)	-0.094	0.476
TAC (U/ml)	0.328	0.001

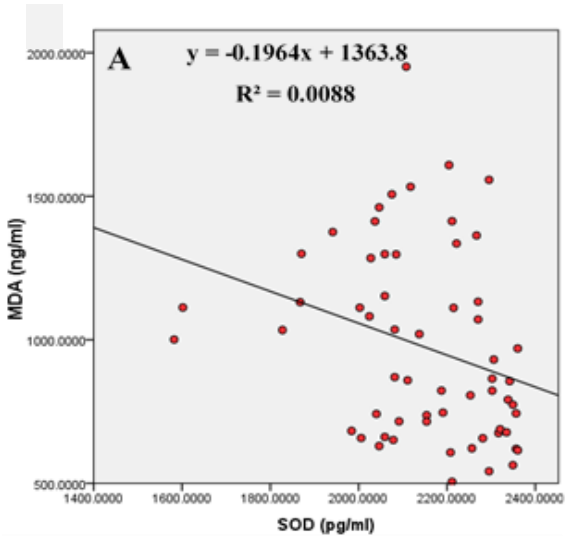

Figure (7) Correlation between SOD with MDA in the SUD patient female group.

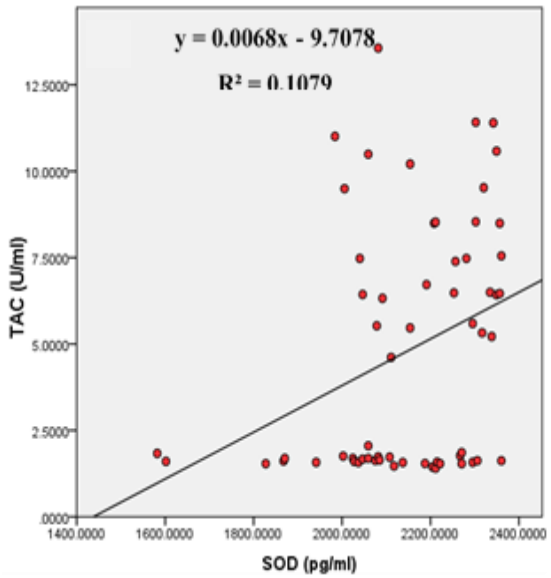

Figure (8) Correlation between SOD with TAC in the SUD patient female group.

Also the results of this study showed a linear regression analysis demonstrate that there is a strong negative association p < 0.05, r = (-0.585) of serum MDA, with TAC in the SUD patient male group. These correlations are shown in Table (5).and fig. (9).

Table (3): Correlation between MDA with TAC in the SUD patient male group		
Parameters	Correlation coefficient r	*P*-value
TAC (U/ml)	-0.585	0.001

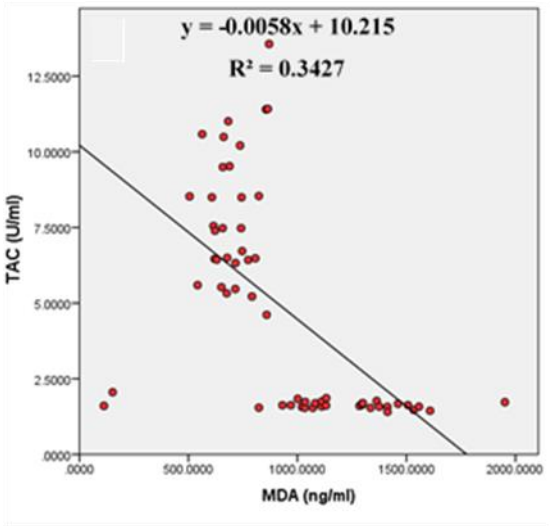

Figure (9) Correlation between MDA with TAC in the SUD patient male group.

5. Discussion

Superoxide dismutase (SOD) is a critical antioxidant that protects the gastric mucosa against oxidative damage by ROS(33). Stress stimulates the sympathetic and parasympathetic systems of the stomach, which results in localized hypoxia and situations that are close to ischemic conditions. This causes an increase in the level of H_2O_2 through the action of SOD, and as a result, hydroxyl radicals damage critical cellular components. (34) as a result, a decrease in antioxidant enzyme SOD activity results in the generation of peroxide radicals, which are damaging to the gastric mucosa. (35) Our findings are in agreement with a study by TANDON et al. who reported that patients with SUD had lower levels of SOD. These findings suggest that patients are more susceptible to oxidative damage, as indicated by the decline in the antioxidant enzyme SOD, which may be sufficient to cause lipid peroxidation.(36) Additionally, a study on patients with duodenal ulcers confirmed similar results, observing a reduction in SOD activity.(37) Our results are in agreement with a study on Iraqi patients with PUD which demonstrated a significant reduction in SOD levels in both the male and female patient groups compared to control subjects. (38)

One of the major causes of cell membrane destruction and cellular damage is lipid peroxidation, which is induced by free radicals. According to Yoshikawa et al., lipid peroxidation may play a role in the development of gastric mucosal lesions brought on by stress.(39) Malondialdehyde (MDA) is an end product of free radical peroxidation of membrane lipids and an indicator of elevated lipid peroxidation. (40) Our findings are in agreement with a study by DEMIR et al., which found higher levels of MDA in patients with gastritis and peptic ulcer disease. These results suggest that cell membrane damage caused by FRs is reflected in MDA levels.(41) According to Darmadi et al., patients with gastritis showed a significant correlation between high levels of MDA and their histological degrees of gastritis.(42) Our findings are similarly consistent with those of Yuan Feng et al. When they discovered an elevation in MDA levels owing to alcohol-induced SUD and indomethacin enhanced tissue damage and neutrophil release in stomach lesions as reported in their study(43)

Our results are consistent with a study by Bilal Aslam et al. They studied biomarkers, TAC. Their study reported that aspirin-induced SUD significantly reduced TAC and catalase levels. This is due to its anti-inflammatory activity and reduced leukocyte infiltration.(44) In another study in mice, M. Raeesi et al. found a significant decrease in TAC concentration in SUD rat patients when compared to a control group.(45) According to Asmaa M. Gomaa et al., their study showed that IND significantly reduced the level of TAC in gastric tissues compared to control groups.(46) A previous investigation by K. workers revealed that mice exposed to Cold-restraint stress (CRS) develop various ulcerative and hemorrhagic lesions of the stomach. CRS is one of the most common types found in nature to form SUD. Exposure to stress has been linked to a variety of health issues, including, hypothalamic-pituitary-adrenal axis stimulation, increased levels of FR, pepsin, and stomach acid, and an increased risk of gastritis. Coupled with the infiltration of inflammatory cells with clot necrosis in the mucosal epithelium.(47)

6. Conclusions

According to this study the Antioxidants (SOD and TAC) with SUD have a negative relationship. Low levels of these Antioxidants may lead to the risk of stomach ulcers. And the Oxidative stress (MDA) have a positive relationship with SUD. As a result, serum Antioxidants may be a useful biomarker for predicting the onset and course of SUD.

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