Vital Annex: International Journal of Novel Research in Advanced Sciences (IJNRAS)
Volume: 02 Issue: 10 | 2023 ISSN: 2751-756X
http://innosci.org

Study the Oxidant – Antioxidant Status in Acne Patients

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Annotation: **Background:** Recent studies have suggested that ROS and oxidative stress are key players in the etiology of inflammatory acne lesions. H2O2 is an illustration of a ROS created by a neutrophil during phagocytosis, while malondialdehyde (MDA) is an illustration of a lipid peroxidation product. The state of oxidative stress and inflammation of the acne lesion are promoted by an imbalance of free radicals and antioxidants caused by excessive ROS production. **Objective:** The purpose of this study was to identify plasma levels of H2O2, MDA, superoxide dismutase, and catalase as potential acne risk factors. **Methods:** One hundred patients with Acne Vulgaris between the ages of 15 and 30 were included as cases. Prior to beginning treatment, individuals had their blood drawn. All participants in the cases and control groups gave written, informed consent after being told of the study's objectives. **Result:** Acne vulgaris patients' levels of MDA, H2O2, SOD and catalase were compared to control groups. The T test was used for statistical analysis. **Conclusion:** A risk factor for acne vulgaris includes blood plasma with high amounts of MDA, H2O2 and low levels of SOD, catalase.

Introduction

Acne vulgaris is a chronic inflammatory and obstructive skin disease that affects the pilosebaceous unit and is most frequent in teenagers and young adults. Acne vulgaris is divided into three categories of lesions: comedonal, papulopustular, and nodulocystic. The inflammatory kind of acne vulgaris includes papulopustular and nodulocystic acne (1,2). Acne vulgaris affects approximately 85% of the population and is most common among adolescents (3). Acne vulgaris is a complex disease characterized by chronic pilosebaceous follicular inflammation. Acne vulgaris is caused primarily by four pathogenic factors: sebaceous gland hyperplasia, which increases sebum production and hypercornification of the pilosebaceous duct, inflammation, and abnormal colonization, particularly by Propionibacterium granulosum (P. acnes) (4,5). Recently, there has been a surge of interest in understanding the involvement of reactive oxygen species and oxidative stress in the pathogenesis of inflammatory acne (6,7). Oxidative stress is caused by an imbalance between the production of reactive oxygen/nitrogen derivatives and the antioxidant defense system, which is involved in the etiology of many diseases such as cardiovascular disease, diabetes, cancer, and neurological diseases. Furthermore, an increasing body of evidence indicates that it plays a role in the development of acne (8,9,10). Acne causes changes in the composition of sebum generated by pilosebaceous units, and reactive oxygen species (ROS) may be released from failing follicular walls. Furthermore, in the etiology of the disorder, it is thought to be the fundamental cause of the advancement of the inflammatory response (11,12). Propionibacterium acnes appears to have an early role in acne development by producing low-molecular-weight chemotactic proteins that encourage neutrophils to congregate around acne comedones (13). Following phagocytosis, these neutrophils release inflammatory factors such as lysosomal enzymes, resulting in follicular epithelial damage (14). Additionally, they generate a number of strong reactive oxygen species (ROS), such as hydroxyl radicals, superoxide anions, and others, which cause tissue damage at inflammatory sites (15,16). These oxidants are well known for inducing oxidative damage in lipid

molecules, resulting in a chemical insult to the surrounding healthy tissues.ROS produced by neutrophils have also been connected to the pathogenesis of a number of inflammatory skin conditions (7,17). Two antioxidant defense mechanisms, superoxide dismutase (SOD) and catalase (CAT), govern ROS formation to maintain a healthy cellular redox balance. Changes in this redox balance, such as increased ROS levels and/or reduced antioxidant levels, can cause oxidative stress (18).Lipid peroxidation, an oxidative breakdown process of polyunsaturated fatty acids driven by ROS and resulting in the formation of highly reactive aldehydes such as malondialdehyde MDA, may be one of the reasons of cellular membrane damage (7,18).

Aims & Objectives

The purpose of this study is to look at the relationship between oxidants and antioxidant status in acne vulgaris patients.

Material and methods

Study area

The case control study was carried out in AL Nasiriyah teaching hospital.

The current investigation included a case control study with (150) samples: (100) patient samples and (50) healthy control samples. The research was carried out between February and July of 2023.

Sampling technique & Data collection

A systematic questionnaire was created to collect information that will help in the selection of persons based on the study's selection criteria. Individuals (patients and controls) were also asked to complete a self-reported questionnaire to collect sociodemographic information.

Blood samples were drawn from the Al-Nasiriyah Teaching Hospital's Draw blood facility. Five milliliters of blood were taken through venipuncture using 5 milliliter disposable syringes, and the blood was kept in a gel tube at room temperature for fifteen minutes. Serums were separated by centrifuging them for 10 minutes at 4000 xg. To limit the number of freezing-thawing cycles, serum samples were frozen at -20°C for further analysis. Disposable, non-pyrogenic, and non-endotoxin blood collection tubes were used.

Estimation of malondialdehyde MDA hydrogen peroxide H2O2,catalase and superoxide dismutase SOD were done by standard technical methods i.e. by using enzyme linked immune sorbent assay (ELISA) with commercially available kits (FineTest) .

Inclusion and Exclusion criteria:

All patients underwent a comprehensive clinical history, clinical examination, and relevant laboratory investigations. Acne vulgaris clinical problems were diagnosed using the most recent WHO clinical practice standards. Analyzing laboratory measurements for the clinical assessment of acne vulgaris revealed the kind of acne.

Exclusion criteria

Cases were excluded if they were on immunosuppressive therapy such as corticosteroids or hormonal therapy, had autoimmunity, were pregnant, had PCOS, had acute or chronic infections, or had acute or chronic inflammatory illnesses.

Ethical Approval Specification

The duration of this study was one year, and institutional ethical committee approval was obtained well in advance of the study's start.

Data Analysis

IBM SPSS Statistics 23.0 program was utilized. Constant data was showed as mean ± standard deviation . Independent samples T test was utilized. $p<0.05$ was admitted statistically significant.

Result

There were 150 people who met both inclusion and exclusion criteria, divided into 100 subjects with inflammatory acne vulgaris as the case group and 50 subjects without acne vulgaris as the control group, matched by age and gender. The basic characteristics of descriptively analyzed study samples are listed below :

Parameters	Group	N	Mean ± S.D	T-value	P-value
MDA	Control	50	28.90 ± 4.57	19.39	0.002
	Patient	100	58.13 ± 10.13		
H2O2	Control	50	0.78 ± 0.44	11.13	0.001
	Patient	100	4.17 ± 2.12		

P-value ≤ 0.05 consider significant.

The difference in mean MDA and H2O2 values between patients of seve re acne and controls was found to be substantially higher ($P < 0.05$).

Acne sufferers' mean levels of the lipid peroxidative product MDA and H2O2 activity were higher than in the control group.

Parameters	Group	N	Mean ± S.D	T-value	P-value
SOD	Control	50	86.91± 4.59	26.35	0.001
	Patient	100	51.62 ± 8.88		
Catalase	Control	50	81.94 ± 8.87	21.61	0.001
	Patient	100	50.67 ± 8.08		

P-value ≤ 0.05 consider significant.

Serum SOD and CAT activity were considerably lower in the acne group compared to the healthy control group.

Discussion and conclusion

Interestingly, levels of lipid peroxidation markers were shown to be adversely linked with CAT or SOD activity in acne patients' serum.

The current investigation found a significant increase in plasma lipid peroxide levels in acne patients when compared to healthy controls. In contrast, the activities of plasma SOD and CAT, as well as total antioxidant capacity (TAC), were found to be considerably lower in acne patients than in healthy persons.

Because the pathophysiology of this disease is multifaceted, there is compelling evidence that oxidative stress plays a role in the beginning of acne(19).Changes in the quantity of sebum as well as the rate of sebum release from the sebaceous glands occur in acne breakouts; additionally, the release of ROS from damaged follicular walls may lead to the increasing inflammatory reactions in acne (13). The SOD-CAT system is a significant enzymatic system that serves as the first line of defense against oxygen-derived free radicals; By catalyzing the dismutation of superoxide into hydrogen peroxide, which is then further transformed into water by catalase, it regulates the formation of ROS. This process is essential for maintaining a healthy cellular redox equilibrium(7). An oxidative stress condition can result from changes to this natural balance, which may be brought

on by increased ROS generation and/or low antioxidant levels (20).Our acne patients' high plasma levels of MDA may be a result of cellular ROS damage.

There are numerous factors that could cause these reactive species, and a rise in ROS could be explained by a decline in antioxidant enzyme levels (21).

These findings imply that the increased production of ROS, which may be related to a deficiency in antioxidant enzymes like SOD or CAT, is at least partially responsible for acne.

The changes in oxidant/antioxidant status observed in this study may be used as a biomarker measure of acne and to assess the effectiveness of treatment.

This hypothesis has to be verified by carrying out additional research on a bigger sample of acne sufferers. Changes in the antioxidant enzyme activity in acne patients' plasma may be a side effect of the body responding to increased oxidative stress.

According to the current study, measuring antioxidant and oxidative stress levels is a good predictor for how acne will progress.

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