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Research Article / Araştırma Makalesi

Evaluation of Total Oxidant and Total Antioxidant Status in Patients with Acne Vulgaris

Akne Vulgarisli Hastalarda Total Oksidan ve Total Antioksidan Durumun Değerlendirilmesi

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Abstract

Acne vulgaris is a common skin disease and has a complex pathogenesis. There is no enough data related with oxidative stress in acne vulgaris. We purposed to assess total oxidant and total antioxidant status in acne vulgaris. We included 32 acne patients and 35 healthy controls in this study. Global Acne Grading System (GAGS) scores were calculated. Serum total oxidant status (TOS) and total antioxidant status (TAS) levels were evaluated and oxidative stress index (OSI) was calculated by proportion of the TOS to the TAS. Mean GAGS scores of acne patients were 14.08 ± 5.72. Mean disease duration of acne patients was 33.97 ± 25.99 months. TAS, TOS and OSI were significantly higher in acne patients (p=0.010, p=0.021, p=0.015, respectively). TAS, TOS and OSI were not correlated with disease duration and GAGS scores (p>0.05). Both oxidant and antioxidant status increased in acne patients. The study showed that oxidative stress may play a role in pathogenesis of acne but it isn't exactly known that is a cause or a result of acne. Advanced studies especially comparing mild to moderate and severe acne patients are required. In addition we consider that antioxidant agents may be beneficial in the treatment of acne.

Keywords: Acne vulgaris; total oxidant status; total antioxidant status; oxidative stress

Özet

Akne vulgaris sık görülen bir deri hastalığıdır ve karmaşık bir patogeneze sahiptir. Literatürde, akne vulgarisde oksidatif stresin durumu ile ilgili yeterli veri yoktur. Bu çalışmada akne vulgarisli hastalarda total oksidan ve total antioksidan seviyenin değerlendirilmesi amaçlandı. Bu çalışmaya 32 akne vulgarisli hasta ve 35 sağlıklı kontrol dahil edildi. Global akne skorlama sistemi (GASS) skorları hesaplandı. Serum total oksidan seviye (TOS), total antioksidan seviye (TAS) ölçüldü ve TOS, TAS'a bölünerek oksidatif stres indeksi (OSİ) hesaplandı. Akne hastalarının ortalama GASS skoru 14.08 ± 5.72 idi. Akne hastalarının ortalama hastalık süresi 33.97 ± 25.99 ay idi. Akne hastalarında TAS, TOS ve OSİ daha yüksekti (p=0.010, p=0.021, p=0.015, sırasıyla). TAS, TOS ve OSİ ile hastalık süresi ve GASS skoru arasında bir ilişki yoktu (p>0.05). Bu çalışmada akne hastalarında oksidan ve antioksidan seviye yüksekti. Bu sonuç oksidatif stresin akne patogenezinde bir rolü olabileceğini düşündürmektedir. Ancak oksidatif stres aknenin nedeni mi yoksa sonucu mu olduğu tam olarak bilinmemektedir. Özellikle hafif-orta ve şiddetli akne hastalarında oksidatif stres durumunu karşılaştıran ileri çalışmaların yapılmasına ihtiyaç vardır. Ayrıca akne tedavisinde antioksidan ajanların faydalı olabileceğini düşünmekteyiz.

Anahtar Kelimeler: Akne vulgaris; total oksidan durum; total antioksidan durum; oksidatif stres

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1. Introduction

Acne vulgaris is a chronic inflammatory disease of the pilosebaceous unit. It is very frequent in adolescent with psychosocial and socioeconomic effects (1,2). Acne lesions are characterized by noninflammatory (open and closed comedones) and inflammatory (papules and pustules) lesions (2). Hyperseborrhoea, abnormal follicular keratinization, follicular colonization with Propionibacterium acnes (P. acnes) and inflammation are suggested as major factors of acne vulgaris pathogenesis (1,3). Moreover, oxidative stress may contribute to pathogenesis of acne vulgaris (4).

Oxidative stress in acne was evaluated by some oxidative stress markers such as catalase (CAT), malondialdehyde (MDA) and superoxide dismutase (SOD) in literature (5-8). These markers do not show total evaluation of oxidative stress. However, total oxidant status (TOS) and total antioxidant status (TAS) allow total evaluation of oxidative stress (9,10). In recent years, TOS and TAS were assessed in various dermatological diseases such as warts, pityriasis rosea, premature hair graying, androgenetic alopecia and rosecea too (11-15). In this study, we aimed to evaluate the TOS and TAS levels in acne patients.

2. Materials and Methods

We enrolled 36 acne vulgaris patients and 35 healthy controls aged between 18-25 years. Participants with any systemic diseases, metabolic syndrome, smoking, drinking, pregnancy and breast feeding were excluded. Using any medications and antioxidant nutritions in the last one month were other exclusion criterions. All individuals signed the informed consent form. Sociodemographic data of the volunteers were recorded. Global Acne Grading System (GAGS) was used to evaluate of acne severity. GAGS points are discounted by region of lesion' factor coefficients (forehead: 2, left cheek: 2, right cheek: 2, nose: 1, chin: 1 and neck, chest and back: 3) multiplying by lesion points (no lesion: 0, comedone: 1, papule: 2, pustule: 3, nodule: 4) and scores of each area are accumulated. Finally intensity of acne is categorized as no (0 point), mild (1-18 points), moderate (19-30 points), severe (31-38 points) and very severe (>39) (16).

Ten cc of venous blood samples were taken from all participants. The blood samples were centrifugated at 1500 g, 10 minutes and their sera were separated. Then the serum samples were preserved at -40°C (maximum 2 months) until TOS and TAS evaluations were taken colorimetrically by Cobas 8000 auto-analyser (Roche Diagnostics, Mannheim, Germany). TOS and TAS levels were evaluated by utilizing commercial kits of Rel Assay (Rel Assay Kit Diagnostics, Turkey). The analysis of TOS was adjusted with hydrogen peroxide (H2O2). The outcomes were stated as micromolar H2O2 equivalent per liter. The assay of TAS was adjusted with a stable antioxidant solution is conventionally referred to Trolox Equivalent which is a vitamin E analogue. TAS level stated as mmol Trolox equiv./lt. OSI level was computed by the method; OSI = [TOS (µmol H2O2 equiv./lt) / TAS (µmol Trolox equiv./lt)] X 100. To make the calculation, TAS valuations transformed to µmol/lt. OSI level showed as an arbitrary unit (17).

The Local Ethics Committee (14/03/19, decision no: 14) accepted the research protocol.

Statistical Analysis

IBM SPSS Statistics 21.0 programme was utilized. Constant data was showed as mean ± standard deviation and median. Categorical data was showed in percentage (%). Pearson's Chi-Square, Independent samples t test and The Spearman Correlation test were utilized. $p<0.05$ was admitted statistically significant.

3. Results

Of acne vulgaris patients, 33.3% (n=12) were male and 66.6% (n=24) female. 42.8% (n=15) of the control group were male, and 47.2% (n=20) were female. Mean age was 20.80 ± 2.30 years in acne group and was 20.91 ± 1.86 years in control group. Acne patients and controls were similar by distribution of sex and age ($p>0.05$). Mean GAGS scores of acne patients was 14.08 ± 5.72 (4-27) so participants had mild-moderate acne. Mean

disease duration of acne patients was 33.97 ± 25.99 months (1-96 months) (Table 1).

Mean TAS, TOS and OSI values were higher in acne group compared to control group (p=0.010, p=0.021, p=0.015, respectively) (Table 2). However, TAS, TOS and OSI were not related with disease duration and GAGS scores in acne group (Table 3).

Table 1. Characteristics in acne patient and control groups

Characteristics		Patients Mean ± SD, % (n)	Controls Mean ± SD, % (n)	p
Gender	Male	33.3% (n=12)	42.8% (n=15)	p>0.05
	Female	66.6% (n=24)	47.2% (n=20)	
Mean age		20.80 ± 2.30 year	20.91 ± 1.86 year	p>0.05
Mean GAGS score		14.08 ± 5.72		
Mean disease duration		33.97 ± 25.99 month		

(GAGS: Global acne grading system)

Table 2. Comparison of TAS, TOS and OSI levels in control and acne patient groups

Characteristics	Controls Mean ± SD	Patients Mean ± SD	p
TAS	2.47 ± 0.14	2.56 ± 0.17	0.021
TOS	3.21 ± 1.70	4.62 ± 2.65	0.010
OSI	129.02 ± 65.93	181.02 ± 105.45	0.015

**Independent Samples Test, (Standard deviation: SD, TAS: Total antioxidant status, TOS: Total oxidant status, OSI: Oxidative stress index)*

Table 3. Correlation between TAS, TOS and OSI levels and GAGS scores and disease duration in acne group

	TAS	TOS	OSI
Disease duration (r;p)	-0.04; 0.798	0.11; 0.488	0.17;0.323
GAGS scores (r;p)	0.24; 0.159	-0.07; 0.654	-0.09; 0.601

**Spearman's Correlation Test, (GAGS scores: Global acne grading system scores, TAS: Total antioxidant status, TOS: Total oxidant status, OSI: Oxidative stress index)*

4. Discussion

In present study, we detected oxidative stress was higher in acne patients. The pathogenesis of acne vulgaris is complex including P. acnes colonization, increased sebum generation and hypercornification of the pilasebaceous duct and inflammatory response. Furthermore, it is tought that oxidative stress may play a role in pathogenesis of acne (1,3,4). Previous studies showed that oxidative stress was higher in acne patients too (5-8). However it isn't exactly known either oxidative stress is a cause of acne or a result of inflammatory response. Acne is considered as a primarily inflammatory disease (18). P. acnes takes part in cutaneous flora, has a beginning role in inflammation of acne. It produces chemotactic factors therefore neutrophils collect at the site. Neutrophils release inflammatory factors such as lysosomal enzymes and generate reactive oxygen species (ROS). They injury the follicular epithelial tissue (4,19). Sebum secretion increase in acne vulgaris too. In addition, balance of sebum production changes contribute to inflammation of acne

(20). Linoleic acid has inhibitive impacts on ROS. Squalene's lipid peroxidation products cause comedogenic impacts. The linoleic acid decreases but squalene levels increase in acne (20,21).

The other major factor of oxidative stress is antioxidant capacity. The organisms have antioxidant defense systems such as SOD, CAT which restrain production of ROS. If ROS levels increase or antioxidant levels decrease, oxidative stress rise (8). Extravagant production of ROS cause damage to structures of cell such as proteins, lipids and nucleic acids (8,22). Oxidative stress involves in etiopathogenesis of various skin illnesses and it may be also in acne vulgaris (5,21,23). Akamutsu H et al showed increased H2O2 generation by neutrophils in acne inflammation and suggested that the production of ROS by neutrophils is an significant factor in pathogenesis of acne (19). In our study TOS levels of acne patients were high too. In the literature, higher oxidant status markers such as MDA, H2O2 and carbonyl contents (biomarker of protein oxidation) and lower antioxidant status markers such as CAT and SOD in serum and scraping samples of acne patients were reported (5-8,22,24,25). But these markers don't show completely oxidant and antioxidant status. Therefore we evaluated TOS and TAS levels which reflect globally total oxidant and antioxidant status in serum of acne patients. In our study, TOS, OSI and TAS were higher in acne patients. These results showed that both oxidant and antioxidant status increase acne. Antioxidant status may have increased response to increased oxidative stress in our study.

In a recent study, Abdel Fattah NS et al. showed that no important difference in MDA and SOD levels in tissue and blood between acne patients and healthy controls. But they detected mild acne patients had higher SOD levels, severe acne patients had lower SOD and higher MDA levels. Moreover, the authors reported a negative correlation between SOD and MDA levels (21). Similarly a negative correlation between MDA and CAT levels in severe acne patients was reported by Al-Shobaili et al. They suggested that high serum levels of MDA may be a result of tissue injury by causing ROS (7).

TAS, TOS and OSI were not related with acne severity and disease duration in our study. Similarly, it was reported that there was no significant differences between oxidant status and antioxidant status markers and acne severity and disease duration in literature (6,21,22). However, Akamutsu et al showed that inflamed acne patients demostrated a significant H2O2 production by neutrophils than comedonal acne patients and controls (19). In another study, a significant correlation were detected between the carbonyl contents levels and GAGS scores. Moreover, as acne severity increased, MDA levels increased and SOD levels decreased were reported (8). However, both TOS and TAS were high in acne patients in our study. This may have been caused by participants had mild to moderate disease (mean GAGS scores of acne patients were 14.08 ± 5.72) so TAS may have been rised in response to high oxidant status. Consequently, it may be suggested that first, oxidant status increase and then antioxidant status increase in response to high oxidative stress in mild to moderate acne. After then, antioxidant status decreases by increase of severity of acne. Antioxidant capacitiy may be exhausted while reducing high oxidative stress.

Study Limitations

Limitation of study was relatively small sample size. Another limitation was absence of participants with severe acne.

5. Conclusions

Both total oxidant and total antioxidant status was higher in mild to moderate acne vulgaris. Oxidative stress may contribute to pathogenesis of acne vulgaris but it isn't exactly known that is a cause or a result of acne. Advanced studies especially comparing mild to moderate and severe acne patients are required to illuminate this situtation. In addition, we consider that antioxidant agents may be beneficial in the treatment of acne.

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