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Original Research Article

Evaluation of Therapeutic Efficacy of Antioxidants in Psoriatic Cases: A Prospective Study

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Abstract:

Background: Psoriasis is a chronic inflammatory skin disorder characterized by excessive proliferation of keratinocytes and immune-mediated inflammation. Oxidative stress has been implicated as an important factor in the pathogenesis of psoriasis. Antioxidants may help reduce oxidative damage and improve clinical outcomes in psoriatic patients.

Objective: To evaluate the therapeutic efficacy of antioxidant supplementation in patients with psoriasis and to determine its effect on clinical severity and oxidative stress markers.

Materials and Methods: A prospective observational study was conducted at Patna Medical College, Patna, Bihar, India, over a period of eight months from March 2025 to November 2025. Eighty patients diagnosed with psoriasis were included in the study. Clinical severity was assessed using the Psoriasis Area and Severity Index (PASI). Serum antioxidant levels including superoxide dismutase (SOD), catalase, and malondialdehyde (MDA) were measured before and after antioxidant therapy. Statistical analysis was performed using SPSS software version 26. Paired t-test and correlation analysis were applied to determine statistical significance.

Results: Following antioxidant therapy, significant improvement was observed in PASI scores and oxidative stress markers. Mean PASI score reduced from 14.6 ± 3.8 to 8.2 ± 2.9 ($p < 0.001$). Serum SOD and catalase levels increased significantly, while MDA levels decreased. Clinical improvement was observed in 72.5% of patients.

Conclusion: Antioxidant supplementation demonstrated beneficial effects in reducing oxidative stress and improving clinical symptoms in psoriasis. The findings suggest that antioxidants may serve as useful adjunctive therapy in psoriasis management.

Keywords: Psoriasis, Antioxidants, Oxidative stress, PASI score, Dermatology.

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Introduction

Psoriasis is a chronic immune-mediated inflammatory skin disease characterized by hyperproliferation of keratinocytes and abnormal differentiation of epidermal cells. It affects approximately 2–3% of the global population and significantly impairs quality of life due to recurrent lesions and associated comorbidities [1].

The exact pathogenesis of psoriasis is complex and involves genetic, immunological, and environmental factors. Immune dysregulation, particularly involving T-cells and cytokines such as tumor necrosis factor-alpha (TNF-α), interleukin-17, and interleukin-23, plays a central role in disease progression [2].

Recent evidence suggests that oxidative stress contributes significantly to the pathophysiology of psoriasis. Oxidative stress results from an imbalance between reactive oxygen species (ROS) production and antioxidant defense mechanisms [3]. Elevated levels of ROS can cause lipid peroxidation, protein damage, and DNA alterations within skin cells.

Several studies have demonstrated increased levels of oxidative stress markers such as malondialdehyde (MDA) in psoriatic patients compared with healthy individuals [4]. At the same time, antioxidant enzymes including superoxide dismutase (SOD) and catalase are often reduced in these patients [5].

Antioxidants play a critical role in neutralizing reactive oxygen species and protecting cellular structures from oxidative damage [6]. Nutritional and pharmacological antioxidants such as vitamin C, vitamin E, selenium, and beta-carotene have been explored for their potential therapeutic benefits in inflammatory diseases including psoriasis [7].

Oxidative stress not only contributes to keratinocyte proliferation but also amplifies inflammatory responses within psoriatic lesions. ROS may activate transcription factors such as nuclear factor-kappa B (NF-κB), which further promotes the release of inflammatory cytokines [8].

Several clinical studies have reported improvements in psoriasis severity following antioxidant therapy. These therapies may reduce oxidative damage, modulate immune responses, and enhance skin healing [9].

The Psoriasis Area and Severity Index (PASI) remain the most widely used tool for evaluating disease severity and treatment outcomes in clinical studies [10]. PASI scoring considers lesion redness, thickness, scaling, and affected body surface area.

Although standard treatments such as topical corticosteroids, phototherapy, and systemic agents are widely used, they may be associated with adverse effects or incomplete remission in some patients [11].

Adjunctive therapies aimed at reducing oxidative stress may therefore offer additional benefits in disease management [12].

Despite growing interest in antioxidant therapy, clinical data from developing countries remain limited. Understanding the therapeutic impact of antioxidants in psoriasis may help improve treatment strategies.

Therefore, the present study was conducted to evaluate the therapeutic efficacy of antioxidant supplementation in patients with psoriasis attending Patna Medical College.

Materials and Methods

Study Design and Study Setting: The present investigation was conducted as a prospective observational clinical study to evaluate the therapeutic efficacy of antioxidant supplementation in patients diagnosed with psoriasis. The study was carried out in the Department of Dermatology at Patna Medical College and Hospital, Patna, Bihar, India, which serves as a major tertiary care referral center for dermatological diseases in the region.

Study Duration: The study was conducted over a period of eight months, from March 2025 to November 2025. During this period, eligible patients attending the dermatology outpatient department with clinical features suggestive of psoriasis were screened for participation.

Sample Size and Sampling Method: A total of 80 patients fulfilling the diagnostic and eligibility criteria were included in the study. Patients were recruited using a consecutive sampling method, whereby all eligible individuals presenting during the study period were invited to participate until the desired sample size was achieved.

Ethical Considerations: The study protocol was reviewed and approved by the Institutional Ethics Committee of Patna Medical College and Hospital prior to initiation of the research. All participants were informed about the purpose, procedures, and possible benefits of the study. Written informed consent was obtained from each participant before enrollment. Patient confidentiality and privacy were maintained throughout the study.

Inclusion Criteria

Patients were included in the study based on the following criteria:

- Age 18 years or above.
- Clinically confirmed diagnosis of psoriasis by a qualified dermatologist.
- Patients willing to participate and provide written informed consent.
- Patients able to attend follow-up evaluation after completion of antioxidant therapy.

Exclusion Criteria

Patients meeting any of the following conditions were excluded from the study:

- Presence of severe systemic illnesses such as uncontrolled diabetes mellitus, hepatic disease, or renal impairment.
- Patients currently receiving systemic immunosuppressive or biologic therapy.
- Individuals with other inflammatory skin disorders that could interfere with clinical evaluation.
- Pregnant or lactating women.
- Patients taking long-term antioxidant supplements prior to enrollment.

Clinical Evaluation: All patients underwent a detailed clinical examination and dermatological assessment at the time of enrollment. Relevant demographic and clinical information including age, gender, duration of disease, and distribution of lesions was recorded using a structured data collection form.

Assessment of Disease Severity

The Psoriasis Area and Severity Index (PASI) was used to assess the severity of psoriasis. PASI is a widely accepted scoring system that evaluates four clinical parameters:

- Erythema (redness)
- Induration (thickness)
- Desquamation (scaling)
- Percentage of body surface area affected

Each parameter was graded according to standard PASI guidelines. The total PASI score ranges from

0 to 72, with higher scores indicating more severe disease.

PASI scoring was performed at:

1. Baseline (before initiation of antioxidant therapy).
2. Post-treatment follow-up after completion of antioxidant supplementation.

Antioxidant Therapy Protocol: All enrolled patients received antioxidant supplementation as adjunctive therapy in addition to standard dermatological care.

The antioxidant regimen consisted of a combination of commonly used antioxidants including:

- Vitamin C.
- Vitamin E.
- Selenium-containing antioxidant preparation.

The supplementation was administered orally for a continuous treatment period of eight weeks. Patients were instructed to adhere to the prescribed regimen and were monitored during follow-up visits.

Clinical improvement following therapy was evaluated by reassessing PASI scores and examining the reduction in erythema, scaling, and plaque thickness.

Biochemical Evaluation of Oxidative Stress Markers

Blood Sample Collection

Venous blood samples were collected from all participants twice during the study period:

1. Before initiation of antioxidant therapy (baseline sample).
2. After completion of antioxidant treatment (post-therapy sample).

Approximately 5 mL of venous blood was collected under aseptic conditions. Samples were centrifuged to separate serum and stored at appropriate temperatures until biochemical analysis.

Measurement of Antioxidant Enzymes

The following oxidative stress markers were analyzed:

Superoxide Dismutase (SOD): Serum superoxide dismutase activity was measured using a standard spectrophotometric assay based on the enzyme's ability to inhibit the oxidation of specific substrates. Results were expressed as units per milliliter (U/mL).

Catalase: Serum catalase activity was determined using established biochemical methods that measure the decomposition of hydrogen peroxide by the enzyme. Values were expressed in units per milliliter (U/mL).

Malondialdehyde (MDA): Serum malondialdehyde levels, an indicator of lipid peroxidation and oxidative stress, were measured using the thiobarbituric acid reactive substances (TBARS) method. Results were expressed as nanomoles per milliliter (nmol/mL).

Baseline biochemical values in the study population demonstrated increased oxidative stress, with mean MDA levels of 6.8 ± 1.2 nmol/mL, while antioxidant enzyme levels were relatively lower.

Evaluation of Clinical Response: Treatment response was assessed based on the degree of reduction in PASI score and overall clinical improvement.

Patients were categorized into three groups:

- **Significant improvement** – marked reduction in PASI score with clear improvement of lesions.
- **Moderate improvement** – partial improvement in lesion severity.
- **Minimal improvement** – slight or limited clinical response.

This classification allowed assessment of overall treatment efficacy in the study population.

Statistical Analysis: All collected data were compiled and analyzed using Statistical Package for Social Sciences (SPSS) software version 26.

Quantitative variables were expressed as mean ± standard deviation (SD), while categorical variables were presented as frequency and percentage.

The following statistical tests were applied:

Paired t-test: Used to compare pre-treatment and post-treatment values of PASI scores and oxidative stress markers including SOD, catalase, and MDA.

Chi-square test: Applied to analyze differences in categorical variables, particularly clinical response categories.

Pearson Correlation Analysis

Performed to determine the relationship between PASI score and oxidative stress markers.

Correlation coefficients (r values) were calculated to assess the strength and direction of associations.

A p-value less than 0.05 was considered statistically significant, while $p < 0.001$ was regarded as highly significant.

Results

A total of 80 patients diagnosed with psoriasis were included in the present prospective study. Clinical and biochemical parameters were evaluated before initiation of antioxidant therapy and after completion of treatment.

Demographic Characteristics of Study Participants: The demographic and baseline clinical characteristics of the study population are presented in Table 1.

The mean age of the participants was 41.3 ± 12.6 years, with ages ranging from 19 to 67 years. The majority of patients were male (57.5%), while 42.5% were female. The mean duration of psoriasis among the participants was 5.8 ± 2.4 years.

These findings indicate a slightly higher prevalence of psoriasis among males compared with females in the present study population.

Table 1: Baseline Demographic Characteristics of Study Participants (n = 80)

Parameter	Value
Mean Age (years)	41.3 ± 12.6
Male	46 (57.5%)
Female	34 (42.5%)
Mean Duration of Disease (years)	5.8 ± 2.4

As shown in Table 1, psoriasis affected individuals predominantly in the middle-aged group, with a modest male predominance.

Change in Clinical Severity (PASI Score): Clinical severity of psoriasis was assessed using the Psoriasis Area and Severity Index (PASI) both before initiation of antioxidant therapy and after completion of treatment.

The mean baseline PASI score was 14.6 ± 3.8, indicating moderate disease severity among the participants. After completion of antioxidant therapy, the mean PASI score decreased significantly to 8.2 ± 2.9.

Statistical analysis using the paired t-test demonstrated a highly significant reduction in PASI score ($p < 0.001$).

These findings suggest that antioxidant therapy resulted in a substantial clinical improvement in psoriatic lesions.

Table 2: Comparison of PASI Score Before and After Antioxidant Therapy

Parameter	Mean ± SD	p-value
Baseline PASI Score	14.6 ± 3.8	
Post-treatment PASI Score	8.2 ± 2.9	<0.001

The reduction in PASI score shown in Table 2 indicates a statistically significant improvement in disease severity following antioxidant supplementation.

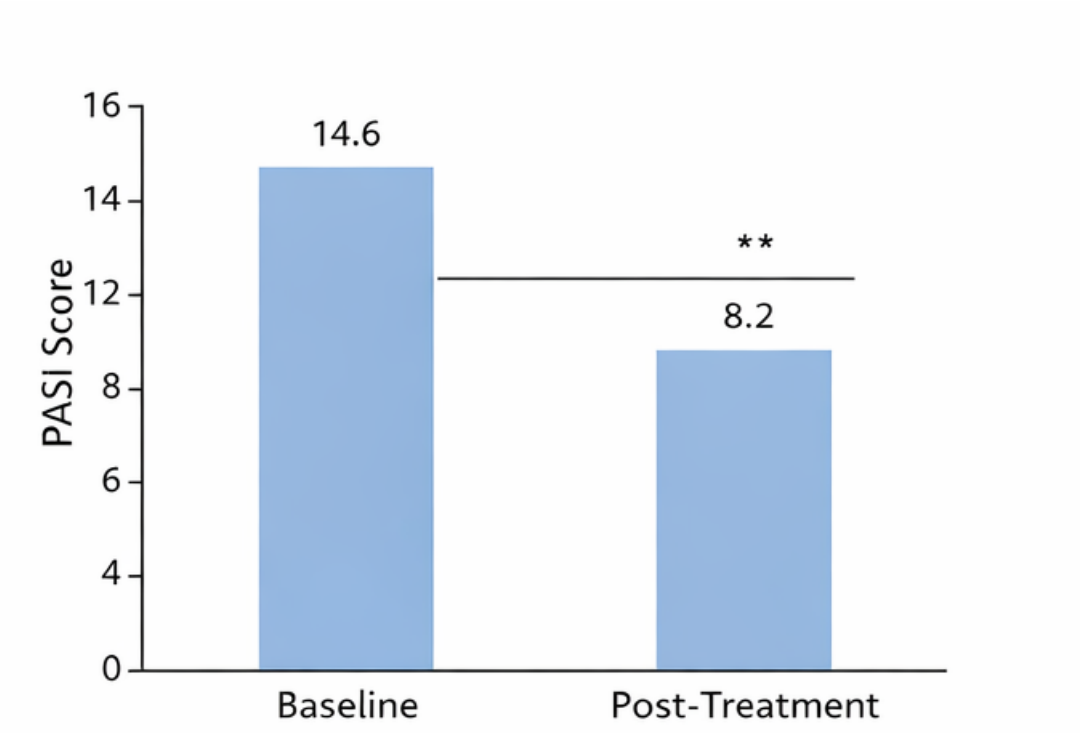

Figure 1 Change in PASI Score Before and After Antioxidant Therapy

Figure 1 illustrates the marked decline in PASI score after antioxidant therapy, reflecting improvement in clinical severity of psoriasis.

Changes in Oxidative Stress Markers

Biochemical evaluation of oxidative stress markers was performed by measuring superoxide dismutase (SOD), catalase, and malondialdehyde (MDA) levels before and after antioxidant therapy. The results are summarized in Table 3.

The mean SOD level increased from 3.2 ± 0.8 U/mL to 5.1 ± 1.0 U/mL, while catalase levels increased from 42.6 ± 9.4 U/mL to 58.7 ± 10.2 U/mL following therapy.

Conversely, the oxidative stress marker MDA decreased significantly from 6.8 ± 1.2 nmol/mL to 4.1 ± 0.9 nmol/mL.

Statistical analysis demonstrated that all biochemical changes were highly significant ($p < 0.001$).

Table 3: Comparison of Oxidative Stress Markers Before and After Antioxidant Therapy

Parameter	Before Treatment (Mean ± SD)	After Treatment (Mean ± SD)	p-value
SOD (U/mL)	3.2 ± 0.8	5.1 ± 1.0	<0.001
Catalase (U/mL)	42.6 ± 9.4	58.7 ± 10.2	<0.001
MDA (nmol/mL)	6.8 ± 1.2	4.1 ± 0.9	<0.001

The data in Table 3 demonstrate that antioxidant therapy significantly improved antioxidant enzyme activity while reducing oxidative damage markers.

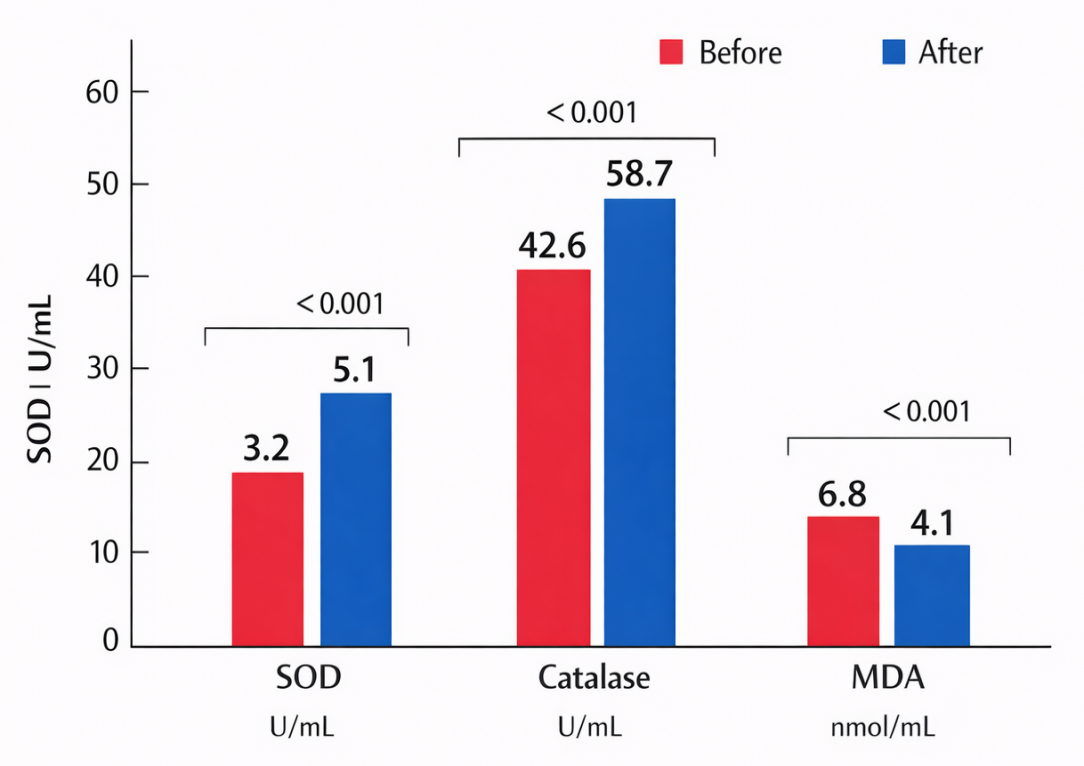

Figure 2: Changes in Oxidative Stress Markers Before and After Therapy

Figure 2 demonstrates the increase in antioxidant enzymes (SOD and catalase) and reduction in oxidative stress marker (MDA) following antioxidant supplementation.

Clinical Response to Antioxidant Therapy: Clinical improvement among patients was evaluated based on reduction in PASI score and overall improvement in skin lesions. The treatment response distribution is presented in Table 4.

Out of 80 patients:

- 58 patients (72.5%) showed significant clinical improvement.
- 14 patients (17.5%) demonstrated moderate improvement.
- 8 patients (10%) exhibited minimal improvement.

Table 4: Clinical Response to Antioxidant Therapy

Clinical Response	Number of Patients	Percentage
Significant Improvement	58	72.5%
Moderate Improvement	14	17.5%
Minimal Improvement	8	10%

The findings in Table 4 indicate that a majority of patients experienced substantial improvement after antioxidant therapy, supporting the therapeutic role of antioxidants in psoriasis management.

Correlation Between PASI Score and Oxidative Stress Markers

Pearson correlation analysis demonstrated a significant positive correlation between PASI score and MDA levels ($r = 0.62$, $p < 0.01$), indicating that higher oxidative stress was associated with increased disease severity.

In contrast, negative correlations were observed between PASI score and antioxidant enzymes, including SOD ($r = -0.48$, $p < 0.01$) and catalase ($r = -0.51$, $p < 0.01$).

These findings suggest that improved antioxidant defense mechanisms are associated with reduced severity of psoriasis.

Discussion

The present study evaluated the therapeutic efficacy of antioxidant supplementation in patients with psoriasis. A significant reduction in PASI scores was observed following antioxidant therapy, indicating improvement in disease severity. In addition, biochemical analysis revealed a significant increase in antioxidant enzymes such as superoxide dismutase (SOD) and catalase, along with a reduction in malondialdehyde (MDA) levels. These findings suggest that antioxidant therapy may help restore oxidative balance and improve clinical outcomes in psoriatic patients.

Oxidative stress has been widely recognized as an important factor in the pathogenesis of psoriasis. Increased production of reactive oxygen species can lead to lipid peroxidation, DNA damage, and activation of inflammatory pathways in skin tissues. Ates et al. reported significantly elevated oxidative stress markers in psoriasis patients, supporting the role of oxidative imbalance in disease development [13]. Similarly, Yildirim et al. demonstrated reduced antioxidant enzyme activity in individuals with psoriasis compared with healthy controls [14].

Lipid peroxidation products such as malondialdehyde serve as reliable indicators of oxidative damage. Relhan et al. observed significantly increased serum MDA levels in psoriasis patients, reflecting enhanced oxidative stress [15]. In the present study, antioxidant therapy resulted in a significant reduction in MDA levels, suggesting decreased oxidative damage following treatment.

Oxidative stress occurs when reactive oxygen species exceed the body's antioxidant defense capacity. Sies described oxidative stress as a key mechanism responsible for cellular injury and inflammatory responses in various chronic diseases [16]. Restoration of antioxidant defense through supplementation may therefore play a beneficial role in controlling inflammation and tissue damage in psoriasis.

Several clinical studies have demonstrated the therapeutic benefits of antioxidant therapy in dermatological conditions. Gabr et al. reported improvement in oxidative stress markers and clinical symptoms among psoriasis patients receiving antioxidant supplementation [17]. Antioxidant vitamins such as vitamin C and vitamin E are known to neutralize free radicals and reduce oxidative injury in skin cells [18].

Reactive oxygen species can also stimulate inflammatory cytokine production and immune activation in psoriatic skin. Kanda et al. suggested that oxidative stress may enhance cytokine-mediated inflammatory pathways involved in psoriasis pathogenesis [19]. By reducing oxidative stress, antioxidant therapy may suppress these inflammatory processes and contribute to clinical improvement.

Antioxidants play a protective role in dermatology by maintaining cellular integrity and preventing oxidative injury. Briganti et al. emphasized that antioxidant mechanisms are essential for preserving normal skin structure and function [20]. Consistent with this concept, our findings demonstrated increased antioxidant enzyme activity following therapy.

Previous investigations have also reported improvements in biochemical markers after antioxidant treatment. Jain et al. observed significant reductions in oxidative stress indicators in psoriasis patients receiving antioxidant therapy [21]. These results further support the potential role of antioxidants as adjunctive treatment options.

Current psoriasis management strategies often involve combination therapies to improve treatment outcomes. Menter et al. highlighted that adjunctive therapies may enhance therapeutic response and reduce disease recurrence [22]. Antioxidant supplementation may therefore complement conventional psoriasis treatments.

Oxidative stress has also been associated with systemic complications of psoriasis, including metabolic and cardiovascular disorders. Gisondi et al. reported that systemic inflammation and oxidative stress contribute to comorbidities frequently observed in psoriasis patients [23]. In this context, antioxidant therapy may offer additional systemic benefits.

Recent dermatological research has emphasized the importance of antioxidants in reducing inflammatory skin damage. Gupta et al. suggested that antioxidant supplementation may help improve disease activity in several oxidative stress–related dermatological conditions [24]. Furthermore, epidemiological studies indicate that psoriasis remains a significant global health problem affecting millions of individuals worldwide [25]. Therefore, exploring adjunctive therapeutic strategies such as antioxidants remains important for improving patient outcomes.

Despite these encouraging findings, certain limitations should be acknowledged. The present study was conducted at a single center with a relatively small sample size and a limited follow-up period. Larger multicenter studies with longer observation periods are required to confirm the long-term benefits of antioxidant therapy in psoriasis.

Overall, the results of the present study demonstrate that antioxidant supplementation significantly improves clinical severity and oxidative stress markers in patients with psoriasis. These findings support the potential role of antioxidants as beneficial adjunctive therapy in psoriasis management.

Conclusion

The findings of the present study indicate that antioxidant supplementation plays a significant role in improving clinical manifestations and reducing oxidative stress among patients with psoriasis. The observed reduction in PASI scores along with favorable changes in oxidative stress markers suggests that antioxidants contribute to restoring the oxidative balance in affected individuals. These results support the potential use of antioxidants as an effective adjunct to conventional therapeutic approaches in psoriasis management. However, further large-scale studies with longer follow-up periods are required to confirm these findings and to establish standardized antioxidant treatment protocols for routine clinical use.

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